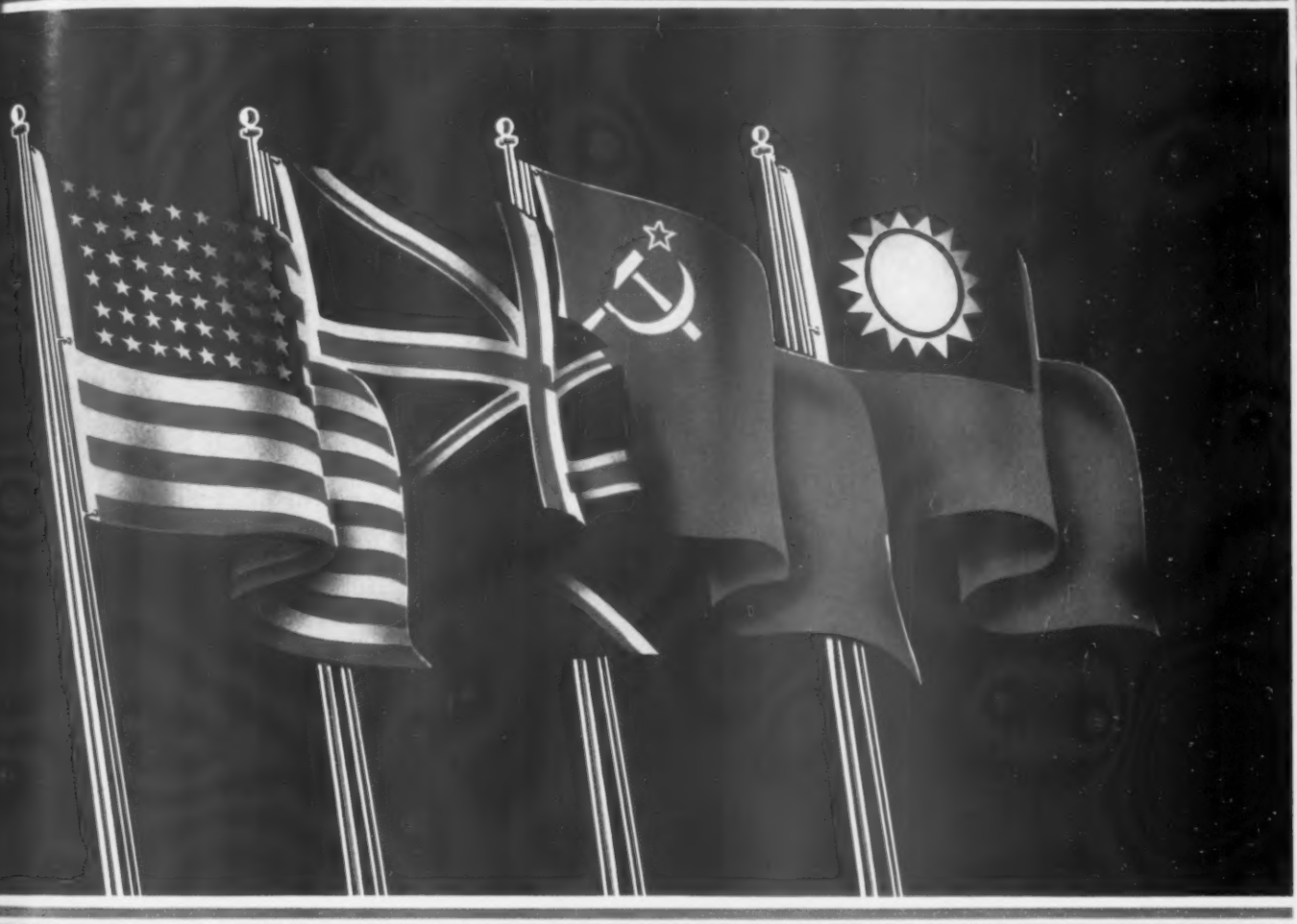
MACHINE and TOOL ENGINEERING

The

FEBRUARY 1943

TOOL ENGINEER

cial Publication of the American Society of Tool Engineers



TOPS IN TOOL STEELS

TOP QUALITY IN TOOL STEELS
FOR THE UNITED NATIONS

Vanadium-Alloys
STEEL CO. LATROBE, PA.

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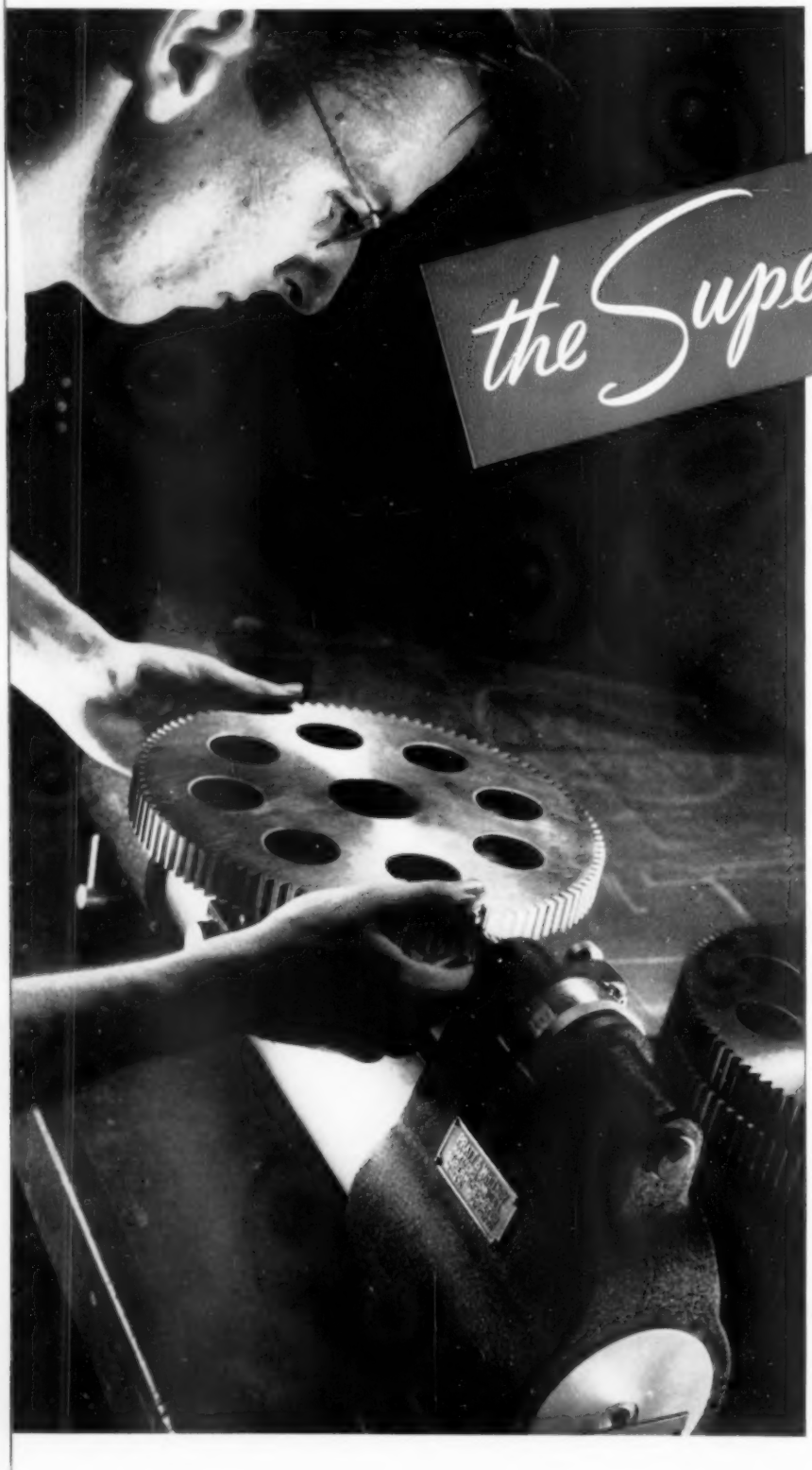
He can repeat this measurement to .0001"... and so can you.. on



the Supermicrometer

HE'S measuring across wires to check the pitch diameter of this bomber engine gear. He must *know* what it is . . . and he will . . . to .0001". And any man will repeat the same reading . . . without "feel" errors.

For it is measured on the Supermicrometer, one of many Pratt & Whitney products that provide *basic accuracy for mass production*. The Supermike is more than a laboratory instrument; it is a sturdy shop tool, used constantly by operators right at the machine. *Yet it reads with laboratory precision . . . directly to "tenths."* A constant-pressure tailstock gives *all* operators the same reading. The "feel" is *built in*. The job in our photo is a bit unusual. Hundreds of Supermikes are measuring screw thread accuracy in American plants.

If you need basic accuracy for mass production, call on Pratt & Whitney. There is no better-paying investment than the right tool for each job. We'll send descriptive literature on this Supermicrometer if you'd like it.

PRATT & WHITNEY

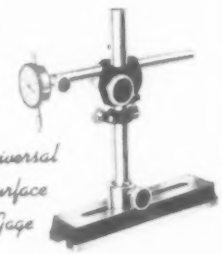
Division Niles-Bement-Pond Company

WEST HARTFORD • CONNECTICUT

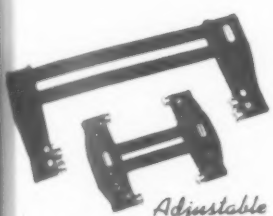
STANDARD Gages

Dial Bore Gage

Snap Gage



Universal Surface Gage



Adjustable Limit Length Gage

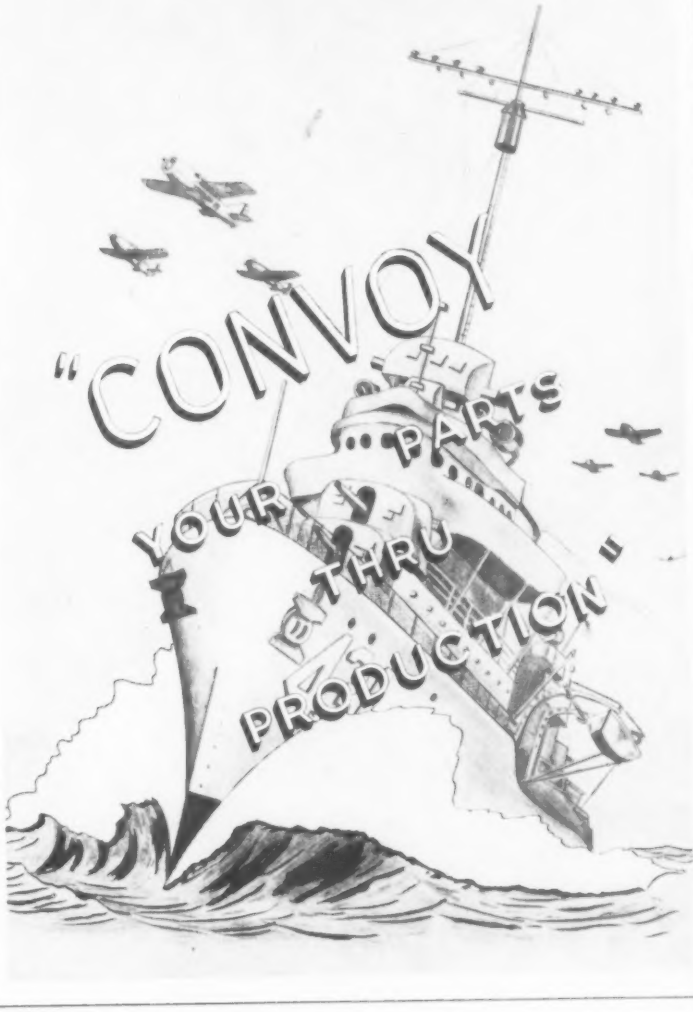
Master Disc

Special Gage

Adjustable Limit Pin Gage

Dial Indicator

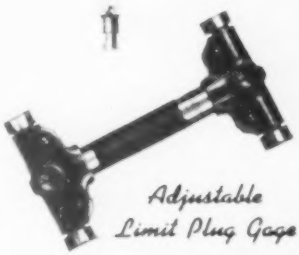
Dial Plug Gage



Cylindrical Plug Gage

Dial Snap Gage

Test Indicator

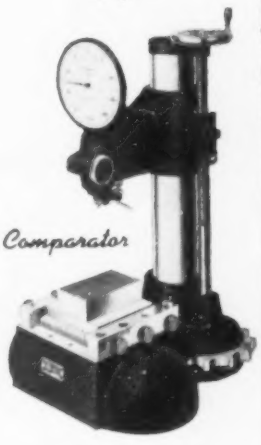


Adjustable Limit Plug Gage

Cylindrical Ring Gage

Depth Gage

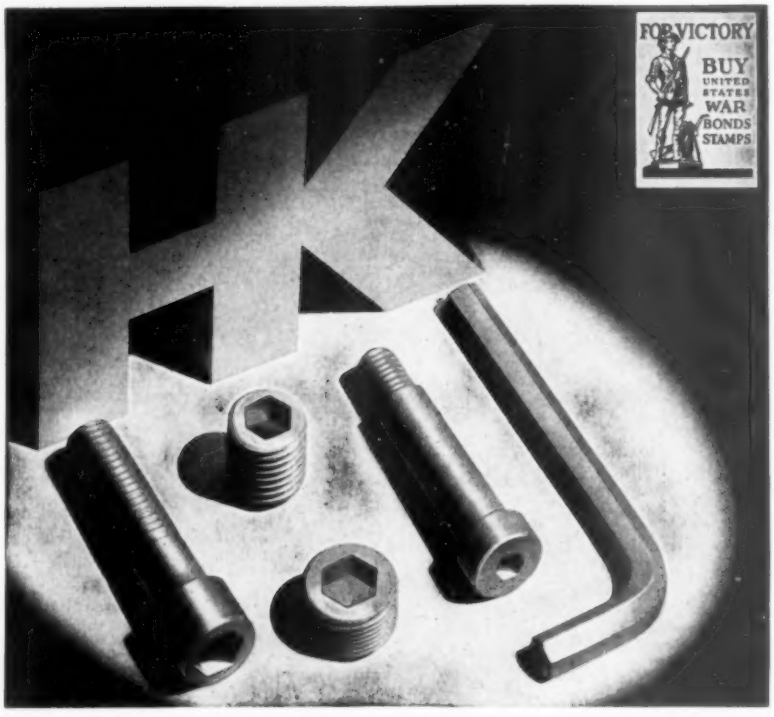
Dial Pin Gage



Comparator

STANDARD GAGE CO. INC. —— POUGHKEEPSIE, N.Y.

GUARANTEED *Unfailing* PERFORMANCE



Completely Cold Forged

HOLO-KROME FIBRO FORGED Socket Screws are guaranteed by Holo-Krome to give Unfailing Performance — the kind of performance demanded today on every front line of Industrial War Production.

Unfailing Performance is Guaranteed by Holo-Krome because of the superior method patented and exclusively used by Holo-Krome in the production of these PRECISION MADE SCREWS.

WRITE FOR CATALOG OF SOCKET SCREW STANDARDS

The
TOOL ENGINEER

VOL. XII T.M. REG. U.S. PAT. OFF. NO. 2

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Business Manager

B. C. YOHE
Circulation Manager

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ANDREW E. RYLANDER, Technical Editor
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PACKING PAGES TIGHTER

BEGINNING with this page, readers will find changes in the appearance of THE TOOL ENGINEER. This month, and even more in March, the effect of WPB's paper limitation order will be seen. But we want to say that you will get just as much magazine—in some respects more, though working out the problem is not easy.

With the production and business staffs, editors are working to make THE TOOL ENGINEER worth its weight in paper. Some features are being pared. For the duration, Production Perspectives replaces the editorial. One less page thus appears in the back of the book, and several hundred pounds of paper are saved—this magazine weighs about 1½ pounds.

In the back half of this issue, you will quickly see how every square inch of type space has been made more valuable. Following the first article in the "Men, Materials and Machines" section, a smaller but highly readable type appears. We set Washington Communique in this face last month, and a hurried check-up proved that it would fill the bill. Readers to whom we talked assured us that the important thing was to keep on filling pages with facts and ideas that would help them build more and better guns, ships, tanks and planes. If to save paper, we had to pack pages tighter, that was the thing to do.

In one third less pages, this type brings you as much reading matter as ever—in fact, because of the growth of this magazine, it is bringing more help to your job, than a year ago, although we must save 10% on the tonnage of paper consumed in 1942.

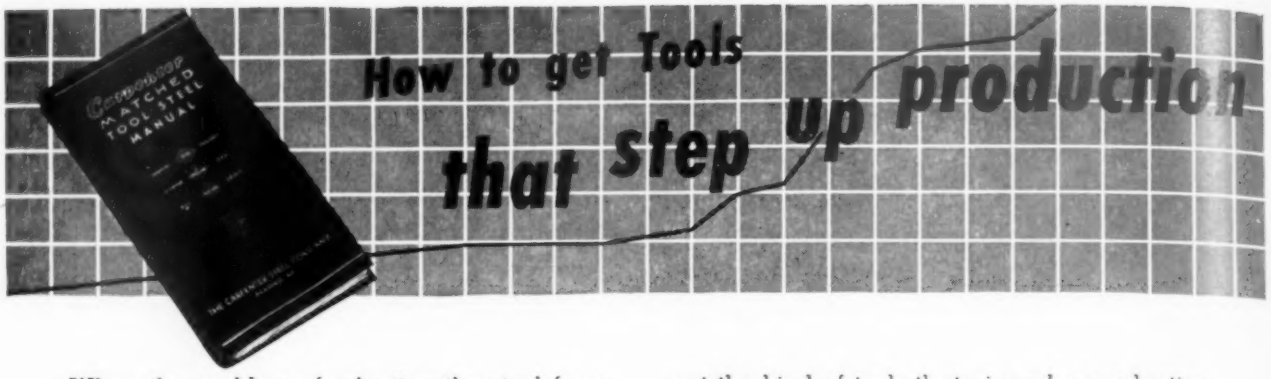
Next month, you will readily detect another conservation step. Less white space, or margin, will appear around type and pictures. More than 30,000 pounds of paper will be saved in 1943 by this move.

•

What about editorial objectives? We will not only aim as high, but we think we may raise the score. There is something about the discipline of not having as many tools that makes you overcompensate. Sometimes you get more out of the facilities remaining than ever before. We know of engine lathes doing more today than some turret lathes performed a year ago on a comparable job.

We hope you will compare the magazine throughout 1943 with issues previous to this date. We would like to know how well its editorial material and advertising help you do a better job.

With the disappearance of the editorial page, the editors plan to meet and talk with you here. Their notes will be written in plant lobbies, a hotel room, or in a day coach, bus, or whatever means of travel they can find in their trips to the nation's war production centers.



When the problem of selecting the steel for a new tool comes up—when the heat treating procedure for best results must be decided upon—that's where "The Carpenter Matched Tool Steel Manual" can help you in many ways to get the kind of tools that give *plus* production. Because it is so handy to use, so packed with information, so *practical,* it is the "bible" of many tool engineers—used over and over to help solve problems of tool steel selection and use.

How to choose the Right Steel for Each Tool

For instance, picking the recommended steel for every type of tool is simplified with the 80-page Tool Steel Selector Section that is included in the Manual. Just flip the pages and it quickly indicates the one to use—and tells you *why*.

How to Heat Treat it properly

Another section of the Manual gives complete and accurate heat treating instructions for each of the Carpenter Matched Tool Steels—in a concise and readily usable form that your tool room will appreciate. It eliminates guesswork, helps you get tools that can step up production. Use this worthwhile information to help your all-out war effort.

How to Quickly Identify Tool Steels

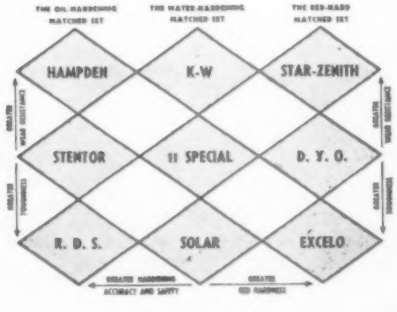
For quickly checking the identity of the tool steel before heat treating tools—for identifying mixed stock and segregating scrap—here is a wall chart (21" x 30") that can help you train your men in spark testing. It clearly identifies the spark of each of the Carpenter Matched Tool Steels—and provides information on spark characteristics caused by the major alloys.

We will be glad to send you the "Carpenter Matched Tool Steel Manual" and the "Guide for Spark Testing Tool Steels" free. Simply write us on your company letterhead.

The Carpenter Steel Company, 122 Bern Street, Reading, Pa.

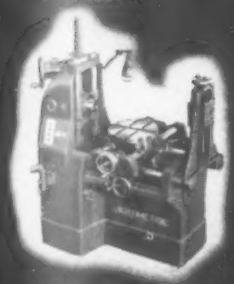
Carpenter MATCHED TOOL STEELS

IMPORTANT BEFORE... VITAL NOW



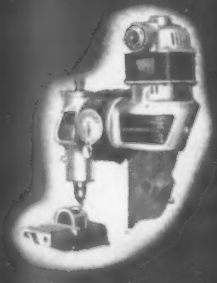
and Attachments for a Wide Variety of Needs:

Rotary Head Milling Machine



Autometric Jig Boring Machine

Milwaukee Midgetmill



Milwaukee Speedmill

Milwaukee Face Mill Grinder

Center Scope

2 REASONS WHY MOLD AND DIE MAKER PREFER THE MILWAUKEE MIDGET MIL

1- EXTREME SMOOTHNESS OF CUTTER OPERATION

2- MINIMUM CUTTER BREAKAGE

THE Midgetmill is designed to get the most from small tools by providing the necessary high speeds to assure accurate, trouble-free performance on the production of dies, molds, metal patterns and templets. Its unusual stability means extreme smoothness of cutter operation and a minimum of cutter breakage.

The completely universal feature, swiveling either toward or away from the column face in either direction, extends the versatility and flexibility of this attachment to hundreds of applications, including a wide variety of angular milling, drilling and horizontal boring operations.

The Midgetmill is equipped with a Thou-Meter which registers in thousandths instantaneously, eliminating costly errors. It has no graduations, dials, stops, counting turns or binding screws. One or more Midgetmills in your shop will help you to keep in step with today's demand for high speed tool and die making and other precision machining.

★ ★ ★

Write for Bulletin 662 C and information on the Milwaukee Midgetmill, the high-speed attachment adaptable to any milling machine.

KEARNEY & TRECKER PRODUCTS CORPORATION
Milwaukee, Wisconsin

Kearney & Trecker Products CORPORATION
Subsidiary of Kearney & Trecker Corporation

Landing-Legs for the Most Powerful Birds in the World

LIBBY SLIDING BED GAP TURRET LATHE
...permits the bed to be adjusted to any desired width gap to suit the work at hand.

Libby Turret Lathes Perform 9 Operations on Airplane Landing Struts

Drilling a $6\frac{1}{4}''$ diameter hole, $34\frac{1}{2}''$ deep, from solid forged steel is the first operation performed on this Libby Heavy Duty Sliding Bed Gap Turret Lathe. Subsequent operations include additional drilling, boring, forming, reaming and threading operations.

Due to the design of the landing leg, it is necessary to use a special cradle-type fixture mounted to the face of the chuck. Further provision is made for handling this oddly shaped part through the bed gap design of this Libby Heavy Duty 4H Turret Lathe. The Sliding Bed Gap Turret Lathe is a Libby innovation. This particular machine is provided with a gap to swing 84″ diameter and the width of the gap may be adjusted from 0″ to 44″. Fixed bed gap machines can also be furnished.

This is another example of International service in unusual turret lathe work. Perhaps our engineers can help you on similar work. They are available for consultation without obligation.

The Job in Brief

Part—Airplane Main Leg Landing Strut.
Material—3140 Forged Steel.
Holding Method — Special Fixture Mounted on Chuck Face.

OPERATIONS:

1st—*Drill* $6\frac{1}{4}''$ *Dia. Hole...*$34\frac{1}{2}''$ deep from solid.
2nd—Drill $2\frac{7}{8}''$ dia., 1″ deep in bottom of $6\frac{1}{4}''$ hole.
3rd—Form $5\frac{13}{16}''$ dia., $3\frac{1}{2}''$ deep, blending $\frac{3}{8}''$ radius to $\frac{3}{4}''$ radius.
4th—Bore 6.875″ hole with piloted bar.
5th—Drill and ream $\frac{7}{8}''$ hole in bottom of 6.875″ hole... 42″ from front end of strut. Tolerance on this operation .001″.
6th—Face with cross slide.

The piece is then heat treated and additional operations performed on Libby Heavy Duty Turret Lathe.

FREE booklet contains additional information concerning other valuable features of the Libby Heavy Duty Turret Lathes...write for your copy today. Write to the Libby Division, 1130 W. 21st Street, Indianapolis, Indiana.

INTERNATIONAL MACHINE TOOL CORPORATION
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The Fly in the Cathedral...

Two million atoms could lie in a line across the dot of an i — yet each alone is a complete solar system, with electrons whirling around a central nucleus like planets around the sun. And that nucleus occupies no more space in its lonely atomic universe than a fly in a cathedral.

This is the physicist's picture of the atom, source of all energy. And today, with giant cyclotrons, he is smashing the atom — hurling these tiny planetary systems at each other with the speed of shooting stars, and with miraculous results: Sodium transformed into magnesium, aluminum into phosphorus — and the atom itself into power beyond the wildest dreams of Watt or Diesel or Edison. . . . In an ordinary glass of water is the potential power of a billion kilowatt hours!

When will industry be able to harness atomic power? Possibly in six months, six years, or not for six decades, but of this you can be certain: One day, just as sure as the earth revolves about the sun, every form of power machinery in use today will be totally obsolete.

This story of atomic power is only an extreme illustration of the problems that industry faces as a result of *change*.

Today, we are living in the midst of far greater and swifter change than the average business is prepared for. As a result, many businesses — seemingly on the rise — are actually on the brink of failure in the new world of post-war production.

If your business is manufacturing with metal . . . and if you are planning ahead now . . . there is one thing that you can do to protect your business against failure to keep pace with changing methods of production: Consult with the leading *specialists* in machine tool engineering!

In the vast and highly specialized field of internal grinding, there is Bryant! Call upon us now!

Bryant Chucking Grinder Company
SPRINGFIELD, VERMONT, U. S. A.

SEND FOR THE MAN FROM BRYANT

We do not make Electronic Tubes

but

WE ARE HELPING TO MAKE THEM BY NOT USING TANTALUM

TANTALUM is an essential element in the electronic tubes used in planes, tanks, ships, "subs," listening devices, "walkie-talkies," and wherever radio or sound equipment or "electric eyes" are used. We are urged to save Tantalum as a scarce, allocated metal on the "most critical" list.

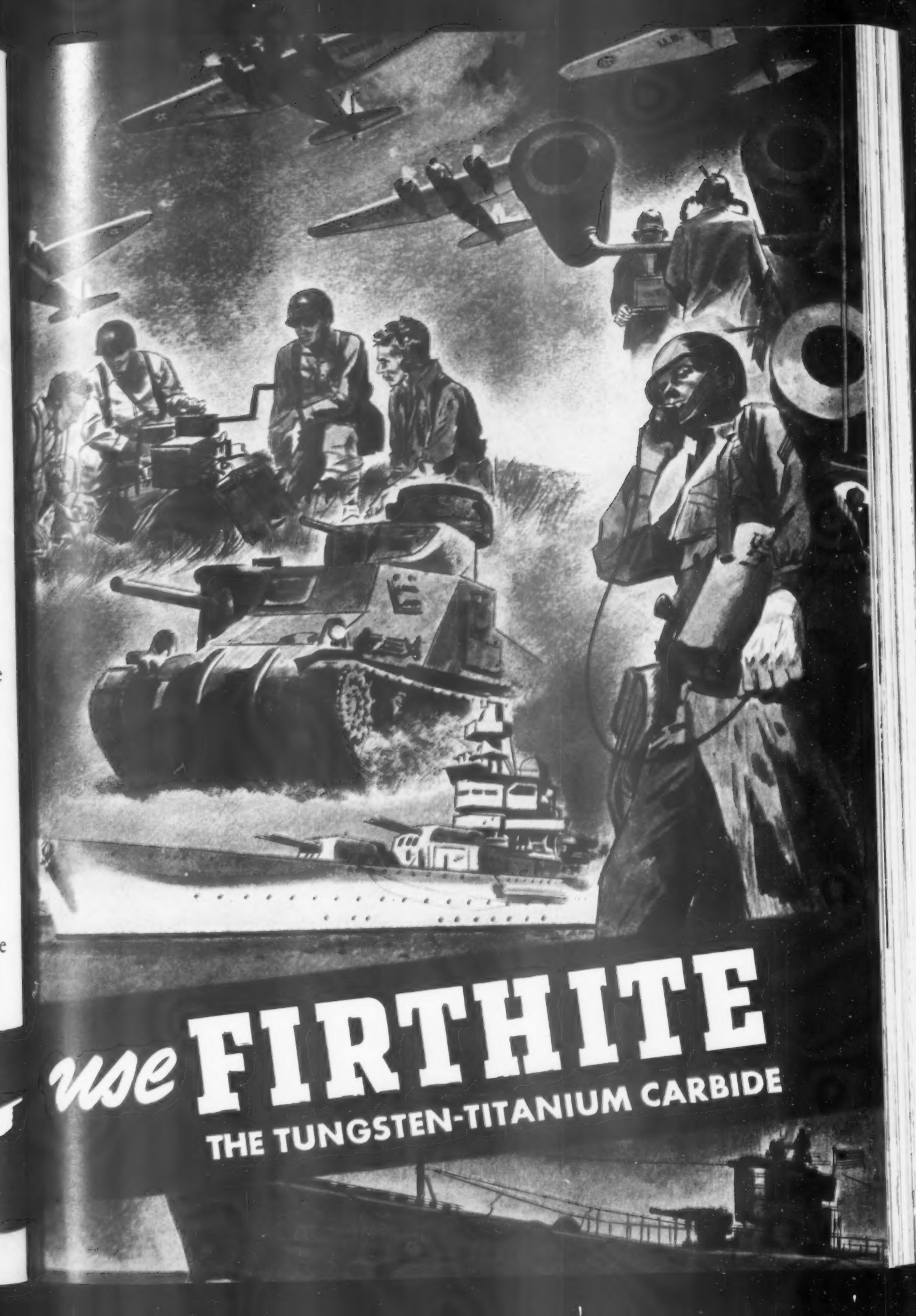
FIRTHITE RESEARCH has enabled us to produce a steel-cutting sintered carbide of superior quality in which Tantalum is **unnecessary.** FIRTHITE Engineers are prepared to demonstrate the Tungsten-Titanium type which:

(1) Is made from domestic alloys;
(2) Is cheaper than the Tantalum types;
(3) Steps up production of steel products;
(4) Releases Tantalum for more essential uses.

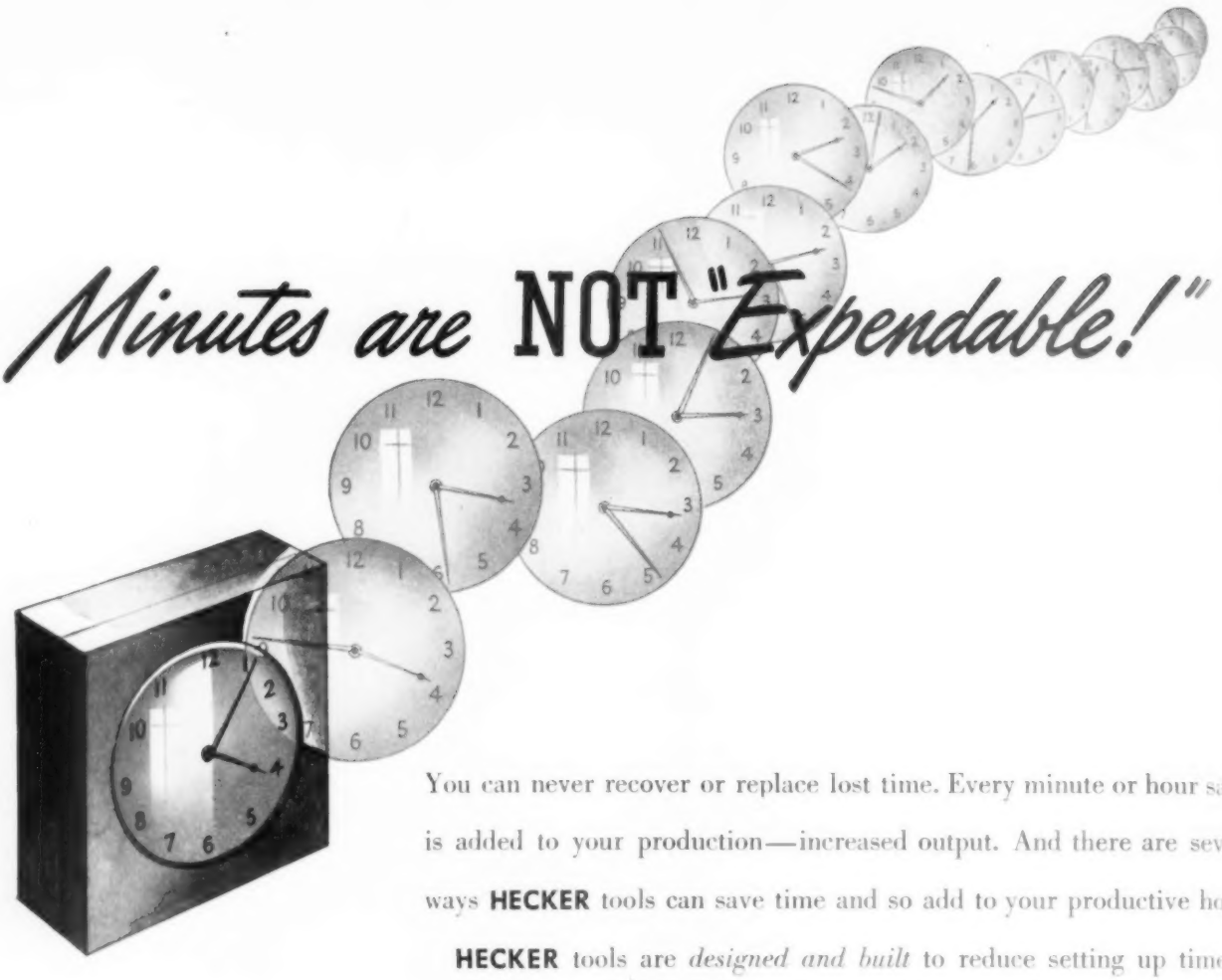
May we prove the value of the Tungsten-Titanium type to you?

Firth-Sterling
STEEL COMPANY

OFFICES: McKEESPORT, PA. NEW YORK - HARTFORD - PHILADELPHIA
CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES


use FIRTHITE
THE TUNGSTEN-TITANIUM CARBIDE

Minutes are NOT *"Expendable!"*



You can never recover or replace lost time. Every minute or hour saved is added to your production—increased output. And there are several ways **HECKER** tools can save time and so add to your productive hours.

HECKER tools are *designed and built* to reduce setting up time, to facilitate precision work, to help inexperienced workers reach and maintain normal output and to cut the number of rejects.

Much of the extra know-how that our engineers put into every **HECKER** tool comes from constant contact with our own production work on precision parts for aircraft. This first-hand knowledge of men, machines and varied job requirements is the *plus* in **HECKER** tooling service.

Let us work out your toughest tooling problem as a demonstration of **HECKER** service. Write A. W. Hecker, 1988 East 66th Street, Cleveland, Ohio, or 517 New Center Building, Detroit, Michigan.

A★W★ Hecker

DESIGNERS AND BUILDERS OF TOOLS, JIGS AND FIXTURES—FABRICATORS OF AIRCRAFT PARTS

Helen of Troy, *U.S.A.*

This was in truth the face that launched a thousand American ships. She was so beautiful, so serene . . . and so damned uncomfortable!

Not alone from the bustles and the corsets and the voluminous billows of tent cloth. Daily her life was besieged with the drudgery and the discomforts of the Gilded Age: The flat iron, the wood stove, the wash tub and the carpet beater, gaslight and the coal grate, horsecars and hansom cabs. But all these things have changed . . . miraculously and wonderfully changed.

And that's the theme of this story: *Change!*

For today the world is changing faster than ever before, and the first 5 years after this war will be equal to any 25 years of the past. Because this is true, we at Jones & Lamson have an important story to tell.

We were already 50 years old when Helen of Troy was a girl. We began with the birth of the Machine Age in America, and even in the very birthplace. Many of the precision machine tools designed and developed by Jones & Lamson engineers during more than a century of the company's history have literally made possible much of America's industrial change.

Because of this background and reputation, Jones & Lamson engineers have actually been called upon by manufacturers — from the largest to the smallest — many thousands of times for counsel, service, or precision machine tools during a single year of this war!

If your business is manufacturing with metal . . . if you have problems today . . . and if you are looking ahead to the swiftly changing markets, products and methods of manufacturing after the war . . . Jones & Lamson engineers and service men can help you. They are at your call!

Universal Turret Lathes . Fay Automatic Lathes . Automatic Thread Grinders . Optical Comparators . Automatic Opening Die Heads

JONES & LAMSON MACHINE CO., SPRINGFIELD, VERMONT, U.S.A.

Profit-producing Machine Tools

YOUR COUNTRY *NEEDS*
MORE DOLLARS *TO WIN!*

The United States has got to have more dollars than regular war bonds, personal income taxes, corporation taxes can bring in.

Contribute Your Share Now!

VICTORY BOND DRIVE

IF *Steel* WERE *Gold*

MAYBE a gold tool, or a gold die, or a gold fixture would not be of much use to you. It's a good bet, though, that if an old one were lying around—on a top shelf, in a dark corner, or under a work bench—well, it wouldn't lie there long!

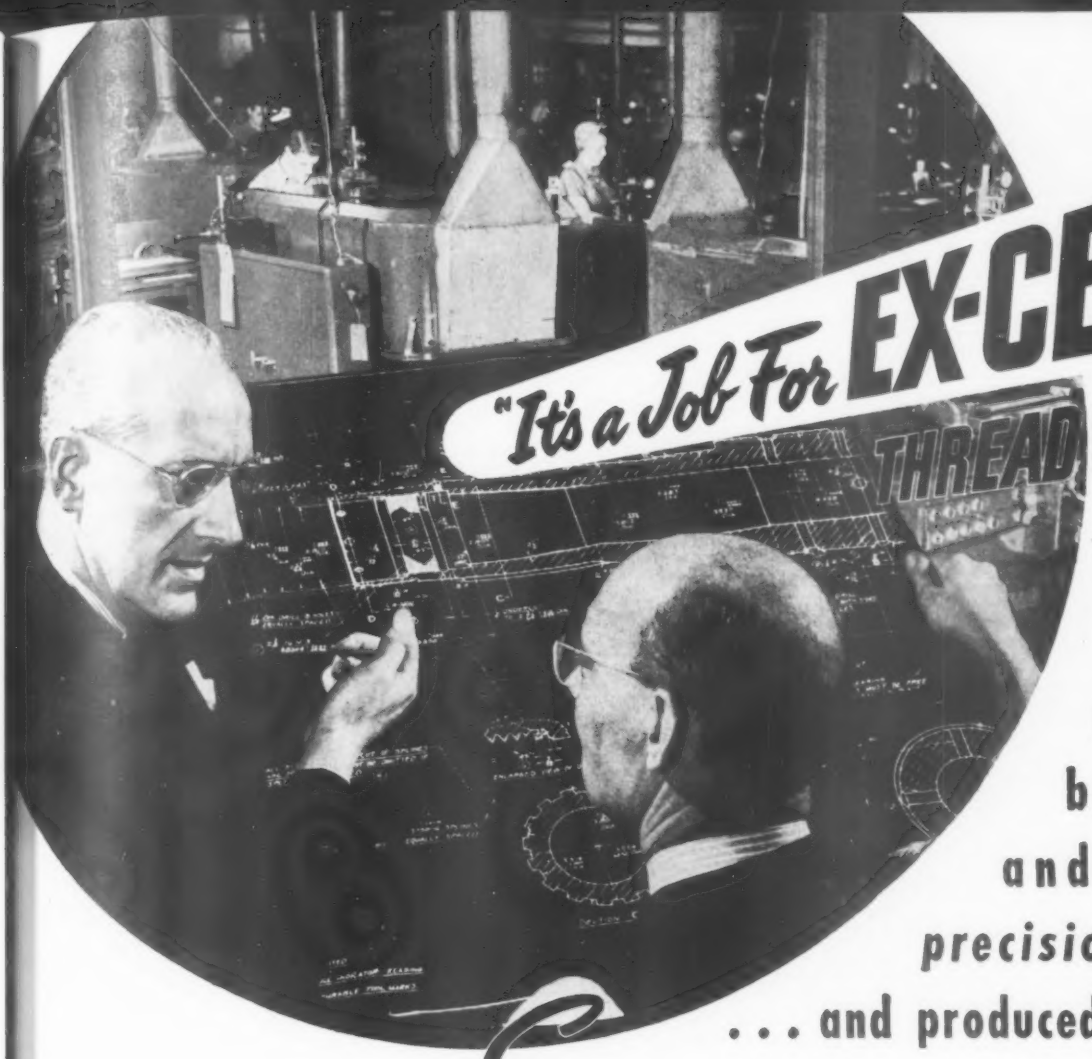
Yes—"getting in the scrap" would be no problem if steel were gold. . . . And yet, by any true standard of value, steel today is worth far more than gold.

With your steel scrap you can purchase victory. With your steel scrap you can guarantee a continued supply of the tools you need to give our fighters the tools they need!

Gold is the coinage of commerce — but steel is the currency of freedom!

W. O. BARNES CO. INC.
DETROIT MICHIGAN

A Barnes Blade is Better



"It's a Job For EX-CELL-O THREAD GRINDERS

. . . these threaded parts must be hardened and ground to *precision* tolerances . . . and produced plenty fast!"

SINCE EX-CELL-O introduced the original production thread grinding machine seven years ago the standard for threaded work has definitely risen. Closer tolerances are now demanded and maintained. The use of harder and heat-treated material in the making of threaded parts no longer presents difficulties. Numerous parts today have threads ground on them directly "from the solid" (often, where the pitch is a relatively fine one, in a single pass). . . . For instance—*precision thread grinding* is the preferred method today among aircraft engine builders for finishing threads on parts such as crankshafts, engine cylinder barrels, crankshaft bearing and connecting rod bolts, tappet adjusting screws, various studs and many other threaded parts. With work pieces of ample threaded length, frequently one operator conveniently handles two or more EX-CELL-O thread grinding machines. *. . . All of which means important savings in production time!*

EX-CELL-O CORPORATION • DETROIT

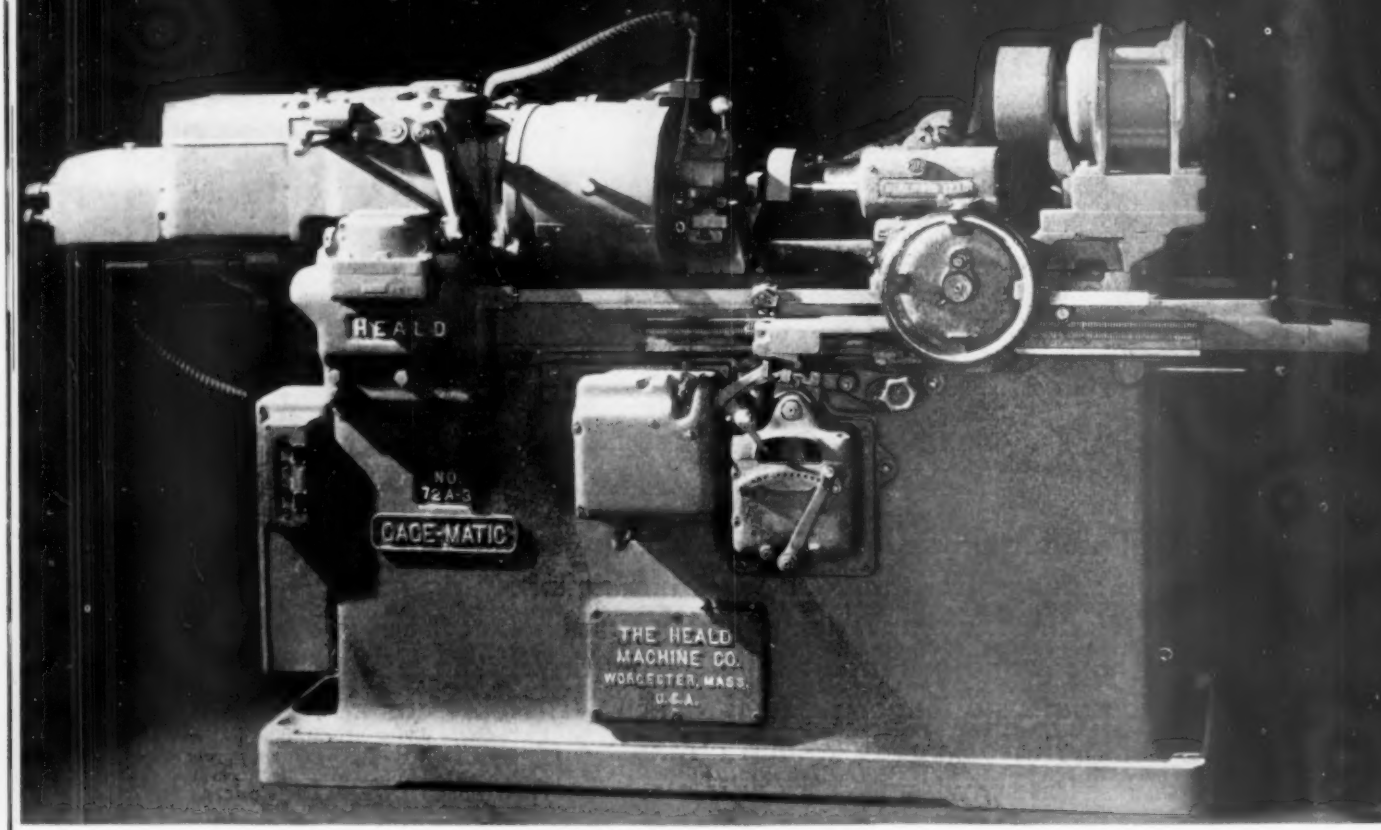
This EX-CELL-O book on Thread Systems, Forms, and Measurements contains much practical information for all those using Precision Thread Grinding Machines. A request for a free copy, on your business letterhead, will be given immediate attention. Address Ex-Cell-O Corporation, 1200 Oakman Boulevard, Detroit, Mich.

each of the plants of Ex-O in Detroit fly flags . . . the and Stripes, as ys, the Army-"E" pennant, the first United Treasury "Bull's-War Bond flag.

ecision THREAD GRINDING, BORING AND LAPPING MACHINES • TOOL GRINDERS • HYDRAULIC VER UNITS • GRINDING SPINDLES • BROACHES • CONTINENTAL CUTTING TOOLS • DRILL JIG BUSH-S • DIESEL FUEL INJECTION EQUIPMENT • P. B. PINS AND BUSHINGS • PRECISION PARTS

ON THE NOSE EVERY TIME

EVEN WITH AVERAGE OPERATORS



Thanks to Automatic Internal Grinding

You're bound to do better and faster grinding with Heald Automatic Internals – they're so easy to operate even for average operators. In fact, Heald Gage-Matics and Size-Matics almost operate themselves, because they are completely automatic except for loading and starting the machine. Their automatic features include automatic grinding to semi-finish size, automatic wheel truing, and automatic grinding to finish size. As a result, these machines make possible uniform accuracy with minimum scrap and reduce operator fatigue. With such features Heald Gage-Matic and Size-Matic Internals are almost human in operation and literally talk production. They'll talk any grinding job into higher production and closer accuracy. Complete information on request.

THE HEALD MACHINE CO. WORCESTER, MASS. U. S. A.

A new year ... a renewed faith

BEFORE us lies a new twelve months . . . a milestone in history which, we hope, will guide us to a fuller realization of America's way of life.

And to the extent that manpower and machinery and munitions co-ordinate, to that extent will the path to Victory be made secure.

Latrobe, in line with Industry everywhere, dedicates this coming year to a renewed faith i American ideals and a renewed effort to maintai maximum production. Backed by traditional quality Latrobe's trademark symbolizes in the months that li ahead, as it has in the past, dependable tool steels fc the essential tools of Victory!

HIGH-SPEED STEELS
FOR THE
TOOLS OF VICTORY

LATROBE
ELECTRIC STEEL COMPANY

Up-Grade Your Workers and Your Work

WITH THE TAFT-PEIRCE No. 1 SURFACE GRINDER

Workers can do better work and more of it—with far less effort—on this differently designed precision machine. Without complicated and time-wasting tool setups, they can produce surfaces which are flat to extremely close tolerances. This machine is made readily adaptable, even to difficult angle and shoulder work, by its unique tilting wheelhead. And finally, it is built to retain its precision through years of incessant operation, with hardened and ground ways, ball mountings, and rigid construction. If you need to produce ultra-accurate work on small tools and parts—the kind of work which is beyond the capabilities of conventional grinders—write for the newly published bulletin which gives complete information about the Taft-Peirce No. 1 Precision Surface Grinder.

The Taft-Peirce Mfg. Co.

WOONSOCKET, RHODE ISLAND

FREE FOLDER SHOWS HOW GREEN MEN CAN MACHINE ANGLE JOBS

with UNIVERSAL 3-way Angle-Set Precision Vises

Angle jobs need not require the full time of your highly trained men, or hold up production and tie up special machines. With UNIVERSAL 3-Way Angle-Set Precision Vises on your production lines, you can handle any kind of single or compound angle work at mass-production speed and cost—and put it on a standard miller or drill press! This free folder shows the way.

With their full three-way adjustment—360° rotation on base, 90° tilting on upper and lower cradles—UNIVERSALS convert old standard machine tools into universals! Further, UNIVERSALS slash set-up time, eliminate need for costly fixtures in angle work, enable inexperienced workers to become "experts" at angle machining! The folder tells how many big war production plants are using them.

You can get immediate delivery of your UNIVERSALS by sending your order now, accompanied by priority rating. The price is only $160 FOB Parma, Michigan. Terms: 2%, 10 days; net, 30 days.

12 JOB SET-UPS SHOWN!

SEE HOW UNIVERSALS can do these things in your own plant, in the hands of youngsters! This free folder gives complete details and specifications. Twelve installation drawings show actual production set-ups. Send the coupon for your copy today.

CLIP COUPON NOW!

UNIVERSAL VISE AND TOOL COMPANY
131 Main Street, Parma, Michigan

TE-2-43

Rush free folder telling how Universals convert standard tools for angle work.
PLEASE PRINT:

Name_____ Title_____

Plant_____

Address_____

for **DISTINGUISHED SERVICE**

"This award is your nation's tribute to your patriotism and to your great work in backing up our soldiers on the fighting fronts. I have full confidence that your present high achievement is indicative of what you will do in the future."

ROBERT P. PATTERSON
Under Secretary of War

THE ARO EQUIP. CORP.
ARO
BRYAN, OHIO

AIRCRAFT PRODUCTS
PNEUMATIC TOOLS
LUBRICATING EQUIPMENT

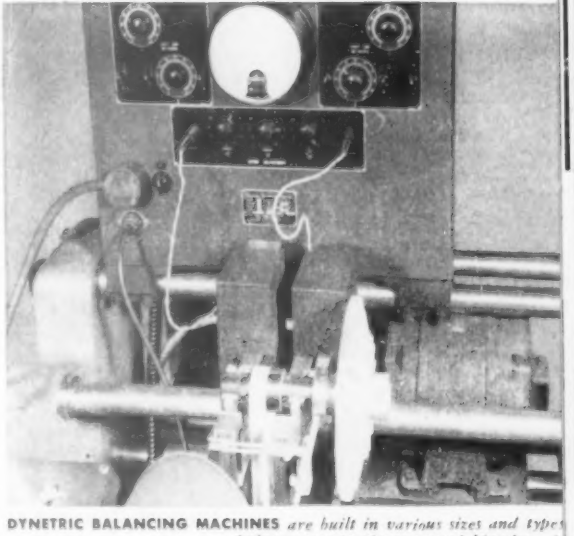
MINUTE MAN FLAG WITH "T" AWARDED JULY, 1942

THIS "OUNCE OF PREVENTION"

...weighed only 1/35,000 lb.!

YOU might never have noticed this slightly burnished spot where 1/5 grain of metal has been removed! But that makes it no less important. Accurately located, it corrects the balance of this super-charger impeller for one of Uncle Sam's fighting planes—to prevent vibration when it is "revved" up to such terrific speeds as 30,000 r.p.m. Without it, you'd have the throb of unbalanced forces, putting heavy strain on bearings, impairing efficiency, inviting trouble!

It is doubtful whether such a fine degree of static and dynamic balance could ever be attained without the aid of Gisholt Dynetric Balancing Machines. Certainly it could not otherwise be done so quickly and easily. For this machine, by picking up unbalance vibrations and electrically amplifying them 1,600,000 times, locates and measures them in a matter of seconds. It's the modern, low-cost way of assuring better performance and longer life in any high-speed rotating part.



DYNETRIC BALANCING MACHINES *are built in various sizes and types to balance any rotating part weighing from 1 up to 50 tons. Literature will be sent on requ*

GISHOLT MACHINE COMPANY
1229 Washington Ave. • Madison, Wis.

GISHOLT

The Army-Navy "E" has been awarded to Gisholt for highest service accomplishments in producing equipment vital to Victory.

ARMY E NAVY

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements

GREEN HANDS WORK EFFICIENTLY WITH KENT-OWENS MACHINES

Kent-Owens 1-14V Vertical Milling Machine

THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

BOSTON
General Machinery Corp.
BUFFALO
Don W. Patterson
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DALLAS
Hamilton-Huster Machinery Co.
DAYTON
Gosiger Machinery Co.
DETROIT
A. C. Haberkorn Machinery Co.
GRAND RAPIDS
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HOUSTON
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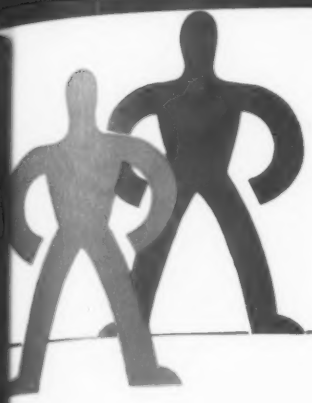
TORONTO
F. F. Barber Machinery Co.
WALKERVILLE
F. F. Barber Machinery Co.

● Get your milling jobs done *right*... with men or WOMEN operators... by depending on Kent-Owens Machines! They're rugged...simple...efficient...designed with practical features that green hands quickly learn to master.

Experienced shop men today more than ever appreciate Kent-Owens advantages that are so important to faster, better production. No matter how tough the job... call on Kent-Owens! Send for latest bulletins. Contact your nearest representative or write us direct.

Kent-Owens Machine Company, Toledo, Ohio.

Call on KENT-OWENS *for Milling Machines*



PARTNERS in production

The Moore Jig Borer and the Moore Jig Grinder, each outstanding in its own specialty, together form a modern toolroom partnership to save production time and increase die life. The die block below shows how one machine complements the other. First, it was bored on the Jig Borer (left) to a tolerance of .001". After the block was hardened and surface-ground, all holes were finish-ground on the Jig Grinder to exact size and location (4 outer holes .125" dia.), including ½° draft on the blank and center holes in the same setting. Hole-grinding time: 2¾ hours. Old method required 8 hours.

THE MOORE JIG BORER, featuring an exclusive process of coordinate location, permits accurate spotting, drilling, reaming and boring in one uninterrupted sequence. Easy to operate, this machine solves layout and jig-boring problems speedily and efficiently... produces more holes to closer tolerances in less time. Sensitive for holes of 1/32", or smaller, and rigid for heavy cuts, it can be used for jig-less, small-lot production. The operator can set the table instantly in the desired position and check himself without fear of error. Your inspection of this process is invited.

THE MOORE JIG GRINDER, an important contribution to the science of tool and die-making, has been developed to meet the growing need for finish-grinding holes to size and location, previously accomplished only by make-shift methods. This machine corrects and finishes jig-bored holes on both hard and soft work within .0001". Holes can be ground straight or tapered, by hand or power feed. Multiple hole-grinding in jigs, heretofore requiring extreme skill, is now performed by semi-skilled operators on the Moore Jig Grinder in one-quarter the time. Ask for full details on the development of this ingenious machine.

Write today for descriptive literature on how these two machines will modernize your toolroom production.

Manufactured by MOORE SPECIAL TOOL CO., INC · Bridgeport, Conn.

MOORE TOOLS

EXCLUSIVE DISTRIBUTORS: **MARBURG BROTHERS, INC • 90 WEST STREET, NEW YORK, N. Y.**

STELLITE HIGH-PRODUCTION CUTTING TOOLS
are Available for Prompt Delivery

Stellite "98M2" and "Star-J-Metal" tools are widely used for machining steel, cast iron, and most of the machinable materials. These dependable tools take heavy cuts at high speeds and heavy feeds—with long life between grinds. This means high production at low cost per piece machined.

The types and sizes in which each grade is available, the purposes for which each type is recommended, and the correct grinding wheels to use are shown in the descriptive price lists illustrated below. Copies of any of these price lists will be sent on request.

Stellite "98M2" tools (left) were developed specifically for machining steel, and are also excellent tools for use on brass, bronze, and cast iron. They are hard, tough, and possess good edge strength.

Stellite Star-J-Metal Tools (right) are used on many materials, including steel and cast iron, for a wide variety of operations—including turning, boring, facing, milling, reaming, grooving and forming.

Standard Tools in Stock

SOLID TOOL BITS—Square, flat, or round . . . wide range of sizes . . . finish-ground ready for use in standard tool holders. Easily converted to various profiles.

WELDED TIP TOOLS—A variety of styles and sizes for use where solid bits are impracticable.

MILLING CUTTER BLADES—For many cutter body types, including Ingersoll, Kearney & Trecker, Modern, Production, OK, and Continental.

WEAR STRIPS—Haynes Stellite alloy castings brazed to a mild steel base, for attachment to boring, driving, and pilot bars to assure accuracy and long life.

Special Tools to Users' Specifications

Many types of special Stellite tools are regularly supplied, cast and finish-ground to users' specifications. These include solid bits, welded tip tools, milling cutter blades, reamer blades, brazed-in blade shell end mills, form tools, boring tools, counterbores, spotfacers, and reamers.

STELLITE
Reg U S Pat Off

HAYNES STELLITE COMPANY
Unit of Union Carbide and Carbon Corporation

New York, N. Y. UCC Kokomo, Indiana

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

• HIGH-PRODUCTION METAL-CUTTING TOOLS ••

The words "Haynes Stellite," and "Stellite" are registered trade-marks.

WE'VE WORKED TOGETHER TO WIN THIS "E"

It's our war, too. We're all proud to be doing the kind of job that merits the "E".

We women in the Detroit Broach plant are going to do our part in adding stars to this flag.

It has been—and will continue to be—our responsibility to make this "E" stand for "Excellence in Engineering", too.

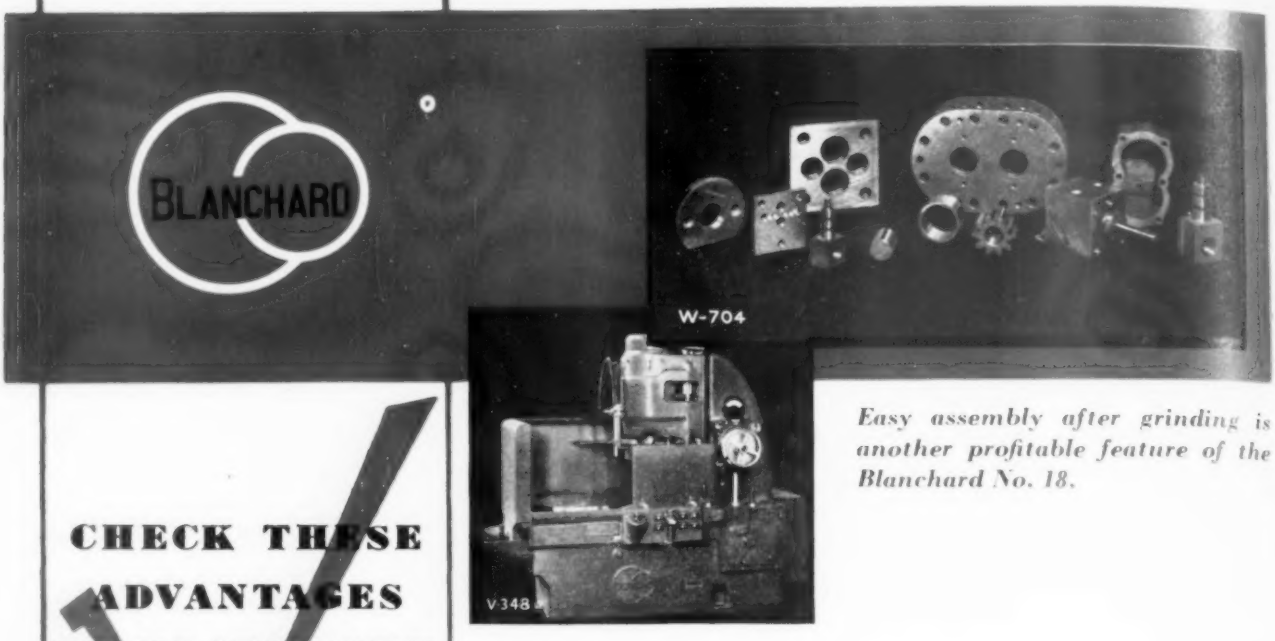
The "E" and the "Bullseye" on our flagstaff! I'm happy to have had the privilege of helping to win both.

Four Detroit Broach employees—thoroughly typical of the entire organization. They have done their jobs well . . . they have earned the honor to wear the Army-Navy "E". It is the combined efforts of men and women like these that will continue to increase American production . . . that will guarantee our ultimate and complete Victory.

DETROIT BROACH COMPANY

20201 Sherwood Avenue
Detroit, Michigan

"PUT IT ON THE BLANCHARD"



Easy assembly after grinding is another profitable feature of the Blanchard No. 18.

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- ★ **Production**
- ★ **Adaptability**
- **Fixture Saving**
- ★ **Operation Saving**
- **Material Saving**
- ★ **Fine Finish**
- ★ **Flatness**
- ★ **Close Limits**

★ . . . . . *Especially valuable on jobs like the one illustrated.*

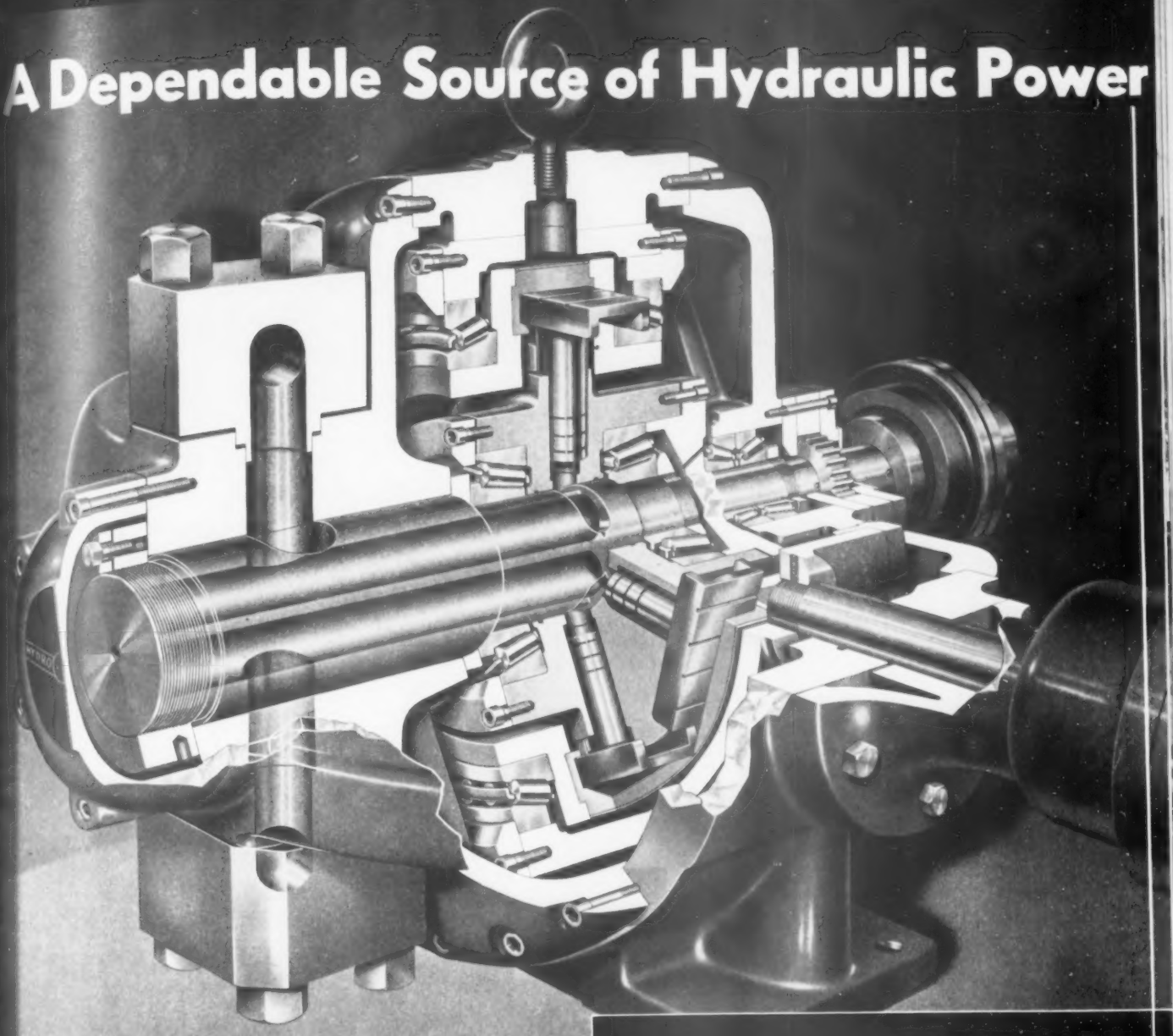
Blanchard Grinding cuts assembly cost. The speed with which parts can be assembled is a direct reflection of machining operations. All the flat surfaces on the pump parts, shown above, were ground on a Blanchard No. 18 Surface Grinder. This manufacturer is keeping his assembly cost low because the surfaces are flat and parallel and the finish is excellent. The accuracy needed for tight joints and correct alignment is maintained without sacrificing production.

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE, MASS.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

A Dependable Source of Hydraulic Power



NO OTHER HYDRAULIC PRESSURE GENERATOR HAS THESE OUTSTANDING FEATURES:

1.—Tapered roller bearings maintain a positive mechanical separation between cylinder rotor and central valve spindle.

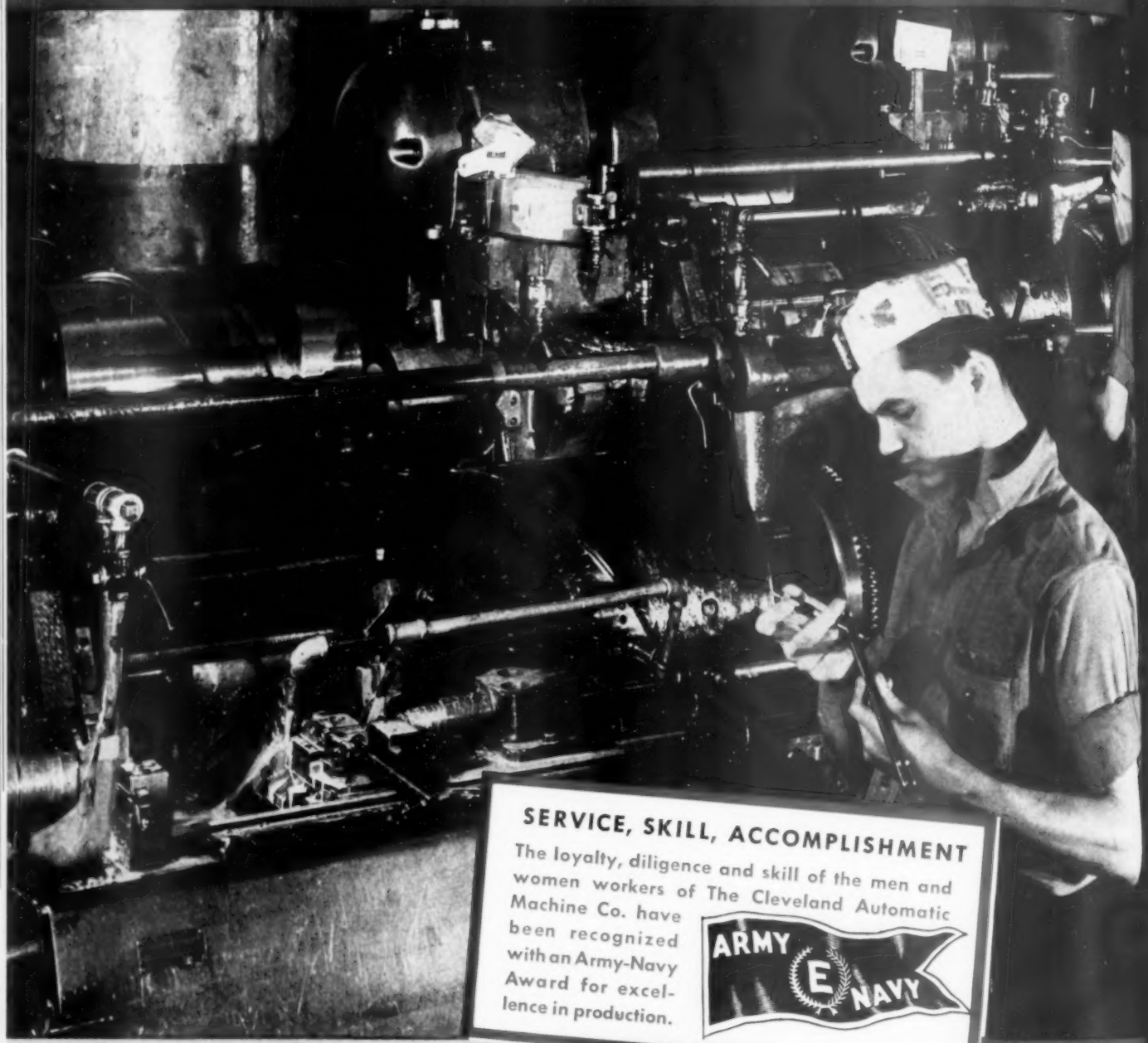
2.—Take-up adjustment of tapered bearings is provided to maintain initial pre-loading for life. This is accomplished from outside of pump, without dismantling.

THE HYDRAULIC PRESS MFG. CO.
Mount Gilead, Ohio, U.S.A.

District Sales Offices: New York, Syracuse, Detroit and Chicago. Representatives in Principal Cities

HYDRO HPM POWER RADIAL PUMPS AND CONTROLS are the Basis for the Dependable, Efficient Operation of HPM FASTRAVERSE METAL WORKING PRESSES

PACKARD MOTOR USES BATTERIES OF MODEL B CLEVELAND *Single Spindle* AUTOMATICS TO PRODUCE AIRCRAFT ENGINE STUDS RAPIDLY



SERVICE, SKILL, ACCOMPLISHMENT

The loyalty, diligence and skill of the men and women workers of The Cleveland Automatic Machine Co. have been recognized with an Army-Navy Award for excellence in production.

ARMY E NAVY

● Producing studs of a number of types and sizes for the famous Rolls Royce aircraft engine at Packard Motor Car Company has been delegated to batteries of Model B, Cleveland *Single Spindle* Automatics. Highly flexible for production of *small lots and short runs,* easily tooled up and kept in operation, Model B is used throughout industry for making shafts of multiple diameters, nipples, tap blanks and pins, and many types of studs, as at Packard. Cutting tools can be mounted singly or in series for turning one or more diameters simultaneously of various lengths. Model B has double cross slides for forming tools and overhead slide for independent cut-off. Built in sizes from 1 1/16-inch up to 2½-inch capacity. Ask for Model B 8-page bulletin.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

2269 ASHLAND ROAD, CLEVELAND, OHIO

Sales Offices: Chicago, 20 N. Wacker Drive, Civic Opera Bldg., Room 1408

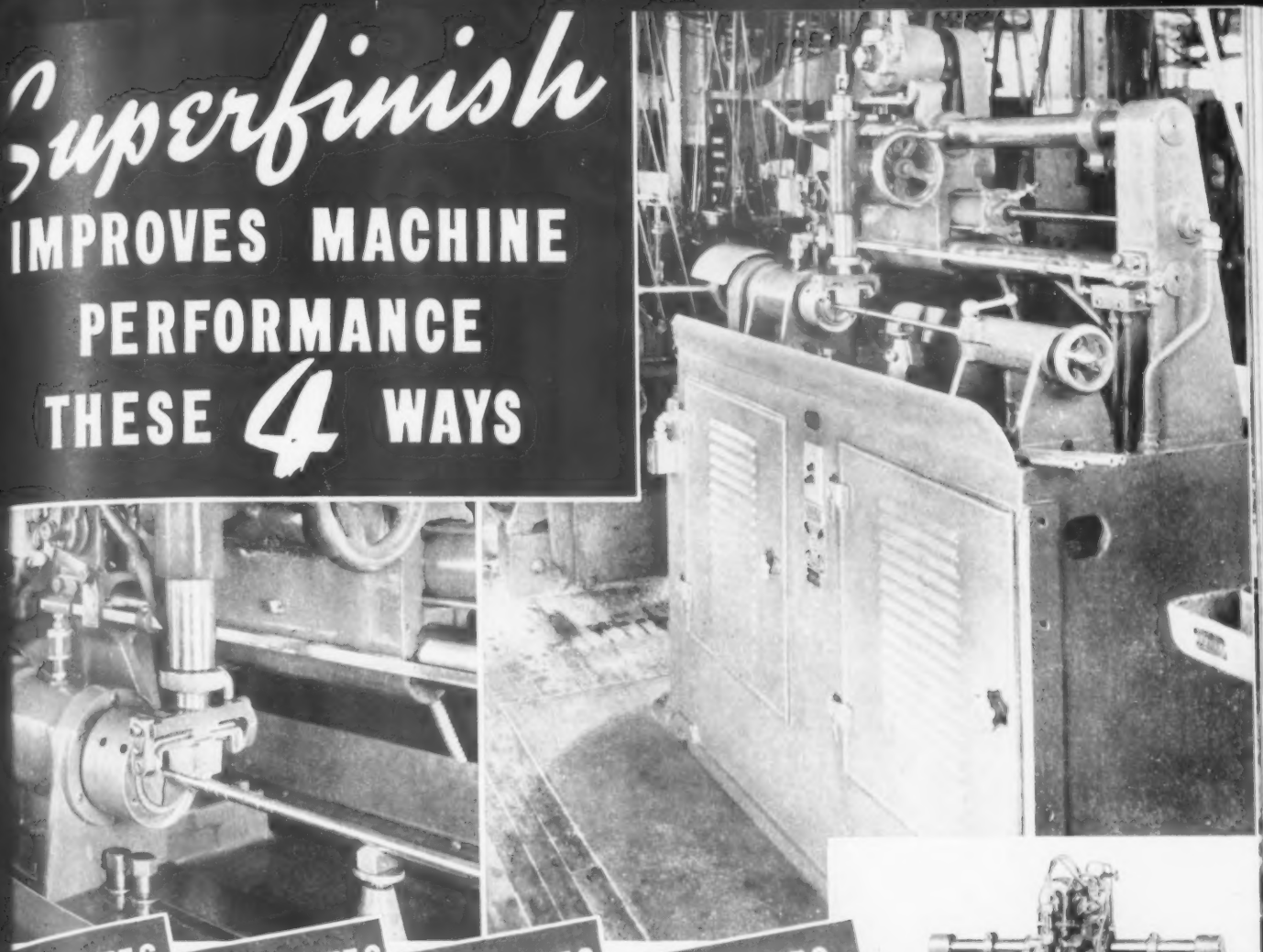
CLEVELAND

Single Spindle

AUTOMATICS

MODEL A—Built in 1 1/16-inch to 9½-inch capacities inclusive

Superfinish IMPROVES MACHINE PERFORMANCE THESE 4 WAYS

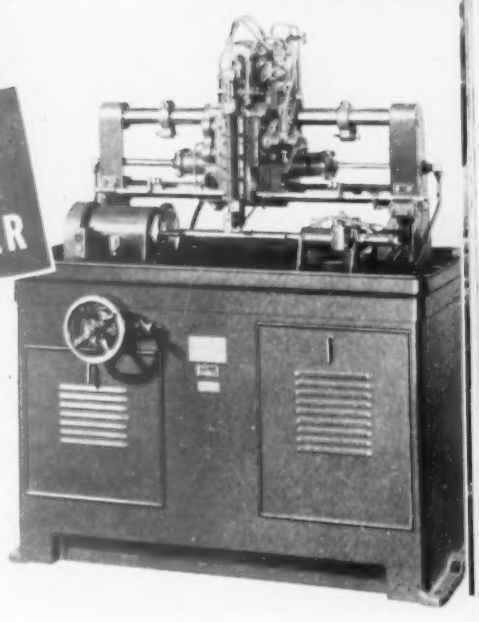


ELIMINATES RUN-IN PERIOD

ELIMINATES FRICTION HEAT

ELIMINATES BEARING WEAR

ELIMINATES VIBRATION AND CHATTER



(*Right*) Foster 4″ x 18″—4″ x 36″ General Purpose Superfinisher

Two drive spindles for sewing machines are superfinished on a Foster 4″ x 18″ General Purpose Superfinishing Machine with the above results. The main shaft is 16″ long x .57975″ dia., and the small shaft is .31275″ dia., and both are held within .0005″ tolerances after superfinishing. The main shaft is superfinished in 2 min. 30 sec., and the small shaft in 45 sec. door-to-floor.

Foster builds two General Purpose Superfinishing Machines, sizes 4″ x 18″ and 4″ x 36″, which are designed to handle a wide range of cylindrical parts. They are capable of producing geometrically improved surfaces of 2 to 3 micro-inches as measured by a profilometer with .0001″ to .0002″ stock removal. This is of particular importance to small production shops and tool rooms.

Superfinish may be used to improve your product's performance, or it may serve to eliminate bearing troubles that have been causing you excessive service expense. International Engineers will be glad to discuss the application of Superfinish to your products and make recommendations without obligation.

Foster also builds Flat Surface, Special Superfinishing Machines, and four sizes of Superfinish Attachments for mounting on engine lathes and turret lathes.

GET THIS FREE BOOKLET

Superfinishing data explains advantages and many uses. . . shows extensive line of general purpose and special machines for miscellaneous or production superfinishing. Write to International Machine Tool Corporation, Foster Division, 1104 W. Beardsley Ave., Elkhart, Indiana.

INTERNATIONAL MACHINE TOOL CORPORATION

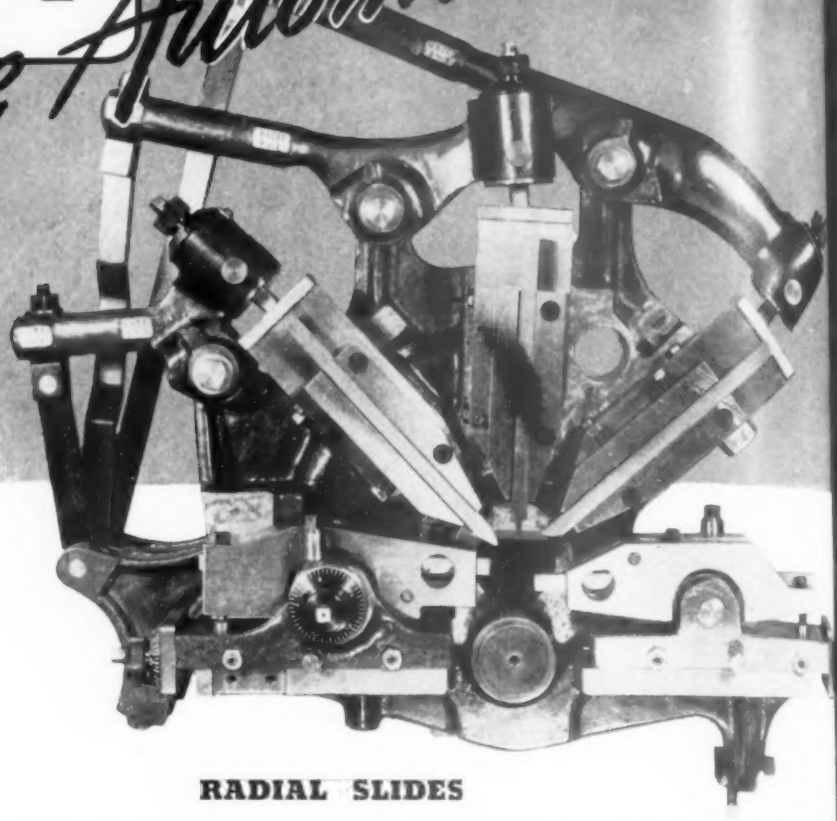
FOSTER DIVISION, ELKHART, INDIANA · LIBBY DIVISION, INDIANAPOLIS, INDIANA

MAIN OFFICE AT ELKHART, INDIANA

FOSTER FASTERMATICS · LIBBY HEAVY DUTY TURRET LATHES · STANDARD TOOLS

CECO Automatics

Swiss Type



Here are a few pieces we have made from bar stock in **ONE** *operation*

RADIAL SLIDES

This universal, Swiss Type, precision machine uses very simple and very inexpensive standard tool bits in place of the conventional indexing turret box tools and form tools. These tool bits turn and face the work as the revolving bar stock is being fed forward through the work guide bushing just back of the bits. This guide bushing does the work of the steady rest on a tool room engine lathe, assuring concentricity. ★ The bits are advanced radially to the work and are receded when not in use by means of flat cams mounted on a single camshaft located at the back of the machine. ★ Accuracy of diameters and lengths of shoulders are maintained by means of double micrometer adjustments. Odd shapes, such as radii, complicated forms, and tapers, can be produced by generating the flat cams mounted on the camshaft. Drilling, reaming, counterboring, tapping, threading, etc. are accomplished by attachments mounted on end of machine.

4 SLIDE — Above machine has four radial tool slides with bar capacity of $\frac{3}{8}$" diameter and a turning length of $1\frac{1}{2}$" with flat cam and $2\frac{3}{4}$" with bell cam, and infinitely variable spindle speeds ranging from 675 to 6100.

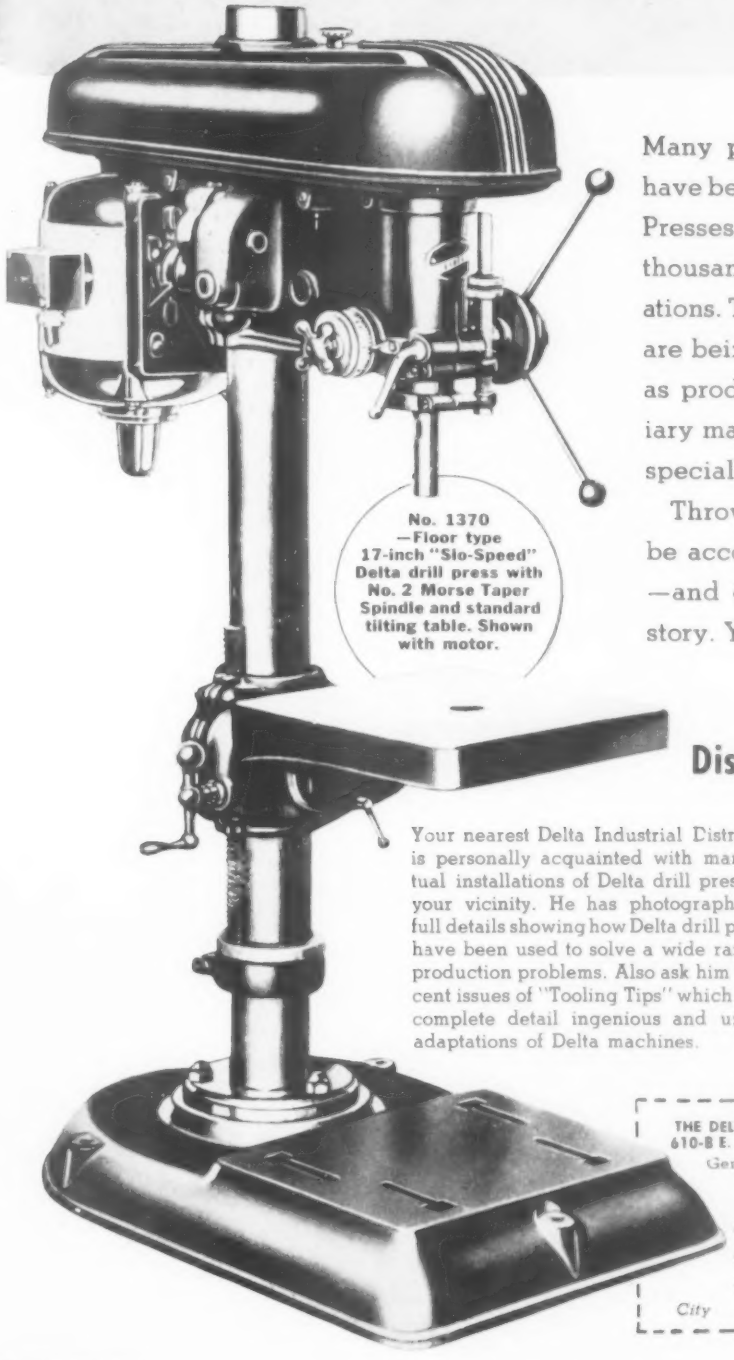
5 SLIDE — Above machine has five radial tool slides with bar capacity of either $\frac{1}{4}$" or $\frac{1}{2}$" with a turning length of 4" with flat cam and infinitely variable spindle speeds ranging from 755-7500.

THE CITY ENGINEERING CO.

Dayton, Ohio

How to Solve Production Problems

with Delta Low-Cost DRILL PRESSES



No. 1370 —Floor type 17-inch "Sio-Speed" Delta drill press with No. 2 Morse Taper Spindle and standard tilting table. Shown with motor.

Many problems that stump production men have been successfully solved with Delta Drill Presses. This has been definitely proven in thousands of cases—on a large variety of operations. Today, these efficient, flexible machines are being used in thousands of plants not only as production line equipment—but as auxiliary machines, special purpose machines, for special set-ups and tool room equipment.

Throw overboard your notions of what can be accomplished with standard drill presses —and get the full details of this remarkable story. You will be in for a distinct surprise!

Ask your Delta Industrial Distributor for Full Details

Your nearest Delta Industrial Distributor is personally acquainted with many actual installations of Delta drill presses in your vicinity. He has photographs and full details showing how Delta drill presses have been used to solve a wide range of production problems. Also ask him for recent issues of "Tooling Tips" which tell in complete detail ingenious and unusual adaptations of Delta machines.

DELTA
MILWAUKEE

THE DELTA MANUFACTURING COMPANY
610-B E. Vienna Avenue, Milwaukee, Wis.

Gentlemen: ☐ Send me name and address of Delta Industrial Distributor in my locality.
☐ I want to receive "Tooling Tips" as issued.

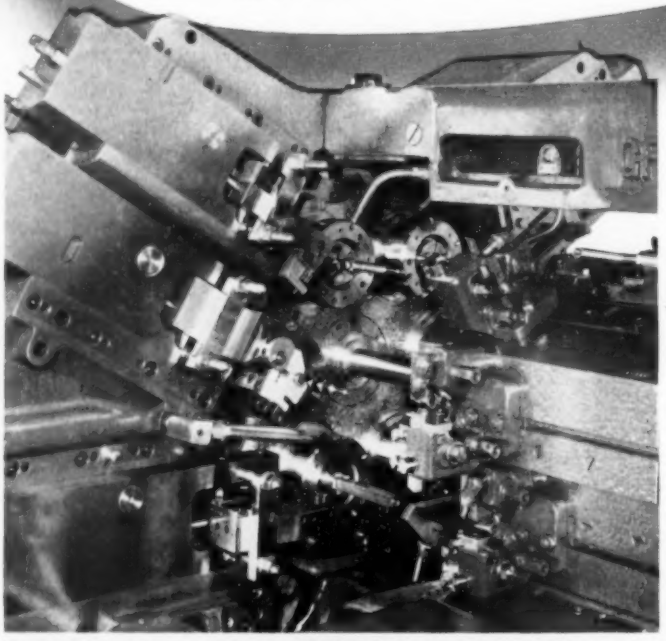
Name

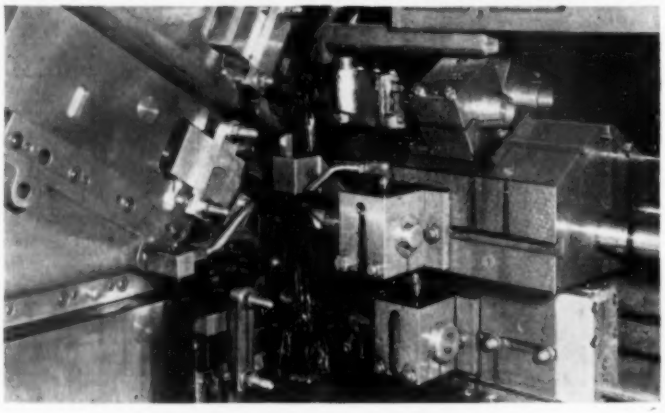
Address

Firm

City *State*

THIS WIDE-OPEN TOOLING AREA ON THE GREENLEE MAKES MY JOB EASIER AND FASTER!





BUILT-IN COOLANT SYSTEM distributes the coolant through the tool and cross slides direct to the various cutting tools. The above photograph of a typical set-up on the Greenlee shows the coolant outlets in each tool holder and the easy-to-use, short nozzles.

JUST ONE OF THE REASONS OPERATORS PREFER GREENLEE SCREW MACHINES

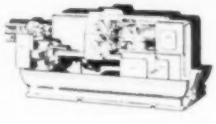
Ask the man who knows . . . the operator right out on the machine . . . and he'll tell you that the Greenlee Multiple-Spindle Screw Machine is one of the easiest machines to set up and to operate that he has ever worked on. He'll tell you that the wide-open tooling area of the Greenlee makes his work so much easier and faster because he has plenty of elbow room in making adjustments and changes. He'll also tell you that the built-in coolant system with an outlet in each tool holder permits the use of convenient, easy-to-use short nozzles to bring the coolant to each cutting tool. He'll mention how the low, compact design of the Greenlee reduces physical strain and eliminates the necessity of standing on the pan or boxes to install tooling to upper positions, and also how the positioning of the cross slides makes it easy for him to observe all cross-slide tools in action. And what's more important he'll tell you that these design features, permitting easier set-up and operation, enable him to obtain maximum efficiency and to turn out more work in a day with less fatigue.

Free Help For Your Operators

Enlarged copies of three recent Greenlee advertisements giving many valuable suggestions and production short cuts are available, without charge, for distribution to your operators. Write today for copies of (1) *14 Practical Suggestions For the Inexperienced Screw Machine Operator;* (2) *Correct Application of Cutting Fluid To Insure Longer Tool Life;* (3) *Suggestions For Changing and Adjusting Collets On Greenlee Screw Machines.*

GREENLEE BROS. & CO.

1942 MASON AVENUE • ROCKFORD, ILLINOIS

ASK THE OPERATOR  ***WHO RUNS ONE . . .***

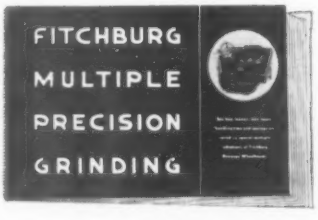
WHAT ABOUT
TOMORROW'S GRINDING COSTS?

You can cut tomorrow's costs with the Fitchburg Grinders you buy today.

Fitchburg low cost method of mounting standard Bowgage Head Grinding Wheel Units for special single applications, or to multiple grind special jobs, will give you faster wartime production at lower cost, and leave you in a position to make rapid changeovers when the present emergency is over.

All Fitchburg Bowgage Head Automatic Precision Grinding Wheel Units are standard. They can be remounted on standard machines, or on new special bases, for operations other than the one originally specified. This feature protects your investment.

Save time and money — speed up cylindrical production grinding with Fitchburg Bowgage Heads.

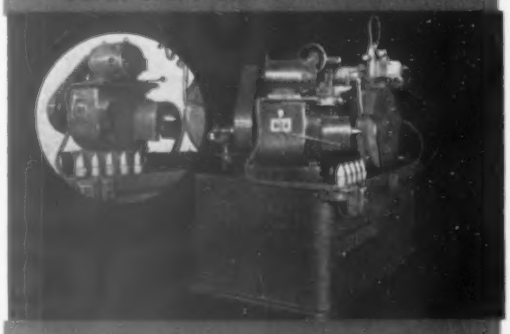


This Book shows how to cut grinding costs. . . . Free to executives. . . . Write for it today.

TRIPLE HEAD MACHINE

DOUBLE HEAD MACHINE

GEAR SHIFT GROOVE GRINDER


OJIVE GRINDER

FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

SAVE WITH AUTOMATIC MULTIPLE PRECISION GRINDING

When You Order HACK SAW BLADES Specify

"Made of INGERSOLL *D-B-L"

(TUNGSTEN .....5.00—6.00
MOLYBDENUM...4.00—5.00)

* Produced by Ingersoll for the past 4 years under an exclusive license arrangement with Allegheny-Ludlum Steel Corporation.

That's the Way You Can Be Sure of Getting D-B-L backed by 4 Years' Manufacturing Experience

Ingersoll D-B-L is the lower cost type of High Speed Steel that has so successfully solved the Hack Saw Blade problem for America's record wartime production.

Four years ago, Ingersoll began to produce D-B-L Steel for Hack Saw Blades. So successful was this product that many Hack Saw Blade users adopted it long before wartime restrictions curtailed the use of vital alloys.

The remarkable performance of Ingersoll D-B-L . . . its relative freedom from decarburization . . . its tough cutting quality and its high impact resistance . . . plus its lower cost, have made it a wartime favorite. Specify *Ingersoll* D-B-L, on its 4-year record of past performance.

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Stainless Steels and Saw Steels, including "18-4-1" and Molybdenum and D-B-L Hack Saw Steels

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FOR SPECIAL USES

Extra Size Gages...

TO EXTRA CLOSE TOLERANCES

Gages like this are the dimensional controls of today's mass production manufacture—they insure the required uniformity and precision fit of parts.

A safe guide in selecting gages you can depend upon is the PM Diamond Emblem. For you it is unquestioned assurance of initial accuracy, plus extra care in finishing and hardening.

Special PM Gages, like the one illustrated here, made to your specifications and drawings, are necessarily delivered subject to priority. Sizable stocks of PM Standard Gages are maintained, from which deliveries are promptly made.

Have you a copy of the new PM Gage and Small Tool Catalog? You'll find it a valuable reference book. Your copy on request.

The PIPE MACHINERY COMPANY Cleveland, O.

GAGES • HOBS • MILLING CUTTERS • SPECIAL TOOLS

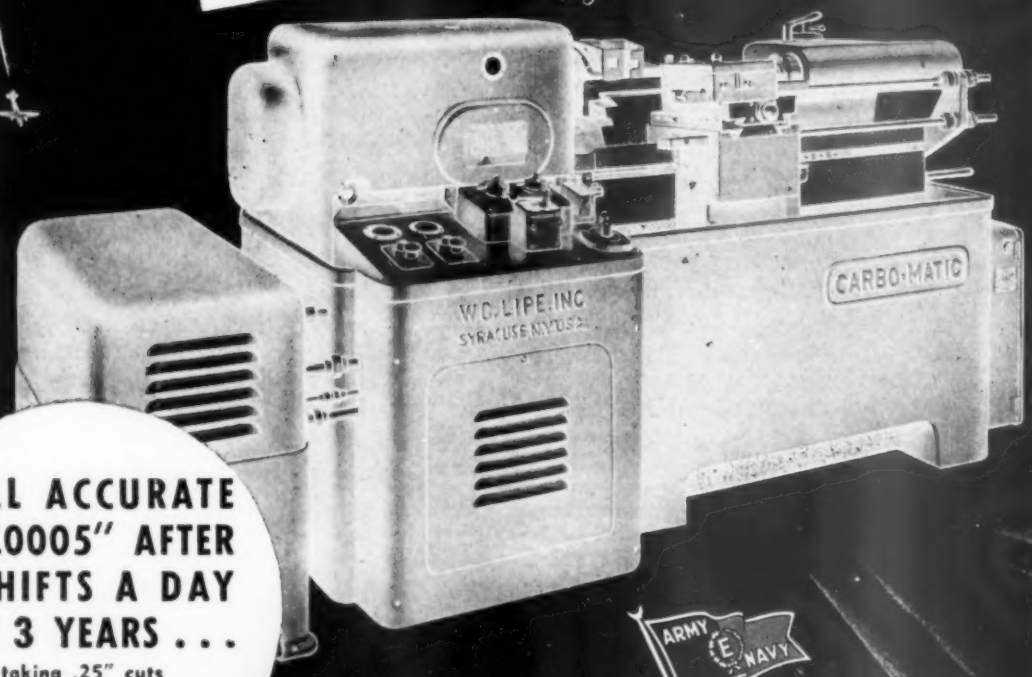
War has proved the Precision, Rigidity and Stamina* of

LIPE
CARBO-MATIC LATHES

Working without stop or let-up for 3 years . . . to constantly finer tolerances . . . and at constantly increasing speeds! That's the test which the urgency of war has put upon Lipe Carbo-Matic Lathes. And they have stood up to it . . . because Lipe engineers foresaw the higher speeds, the deeper cuts, the tougher steels that were bound to follow in the footsteps of carbide tools.

They designed this lathe to take care of those factors. They put in braced and rigid massiveness. They gave it a powerful motor . . . a chatter-free cone-worm-gear drive! Then they made it automatic throughout the complete cycle, so that one man could tend a battery of these lathes—extra speedy though they are. The operator merely loads and unloads. Hydraulic power operates the holding equipment, longitudinal and cross feeds and tail-stock quill. Swing over carriage 8", between centers 20".

You know it's coming—greater wartime and peacetime production than ever before dreamed possible. So write now for complete specifications and delivery dates on the Lipe Carbo-Matic Lathe—product of the famous Lipe engineering shops.



*STILL ACCURATE TO .0005" AFTER 3 SHIFTS A DAY FOR 3 YEARS . . .

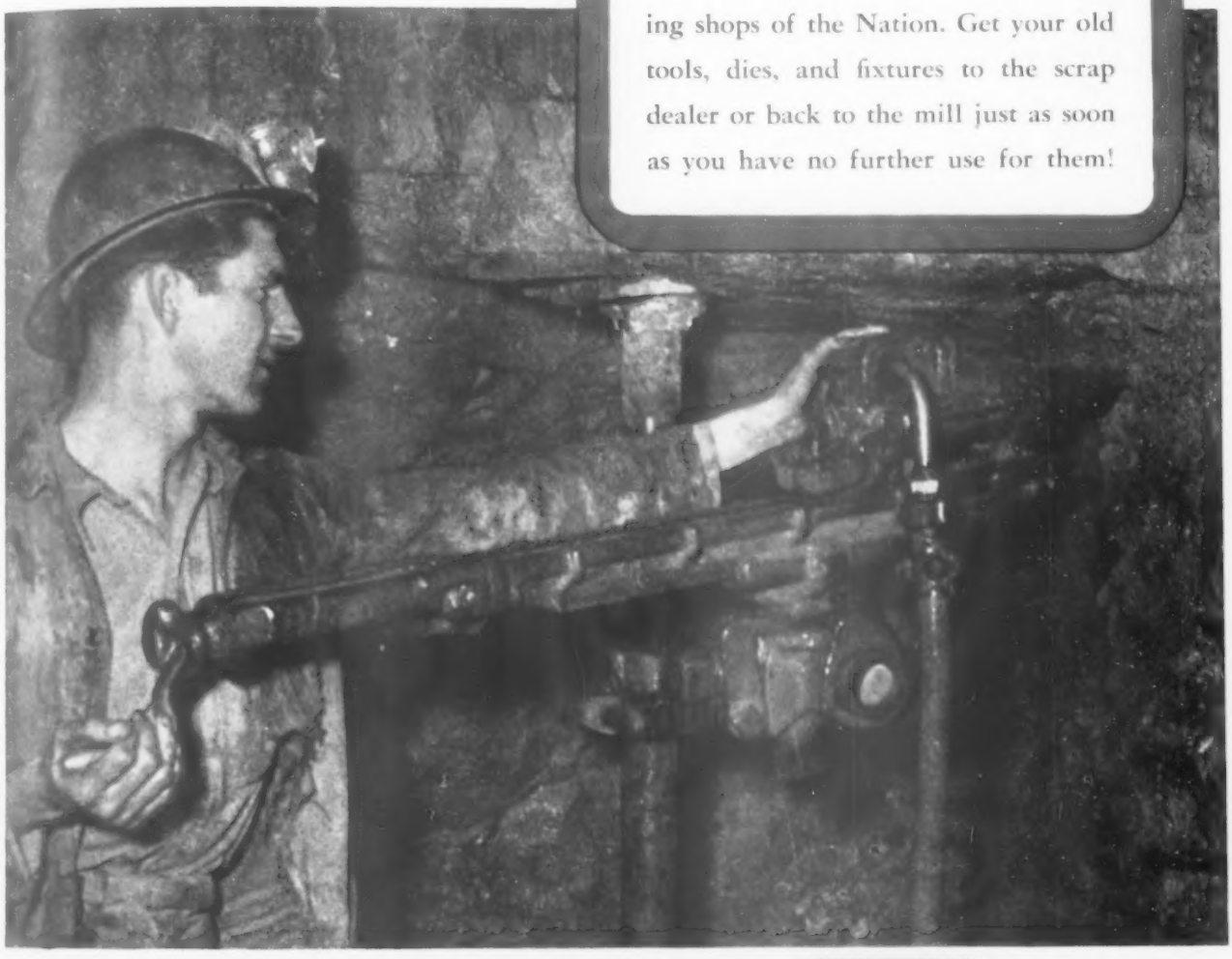
taking .25" cuts with a .030" feed at 600 rpm on 3" H.E. shell forgings

ARMY E NAVY

LIPE ROLLWAY CORPORATION
Syracuse, N. Y.

A Mine OF PURE HIGH SPEED STEEL!

• MANY would consider the war almost won if a mine were discovered which, by some freak of nature, bore only high speed steel. The tungsten, molybdenum, vanadium, and other elements alloy steels contain are needed badly and needed *now* . . . In effect, such a mine exists—in the metal-working shops of the Nation. Get your old tools, dies, and fixtures to the scrap dealer or back to the mill just as soon as you have no further use for them!



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Answering higher production demands

Deep-draw die made of Masonite Die Stock to produce engine cowling at Grumann Aircraft & Engineering Company

AMERICAN industry races forward in the roaring Battle of Production, reaching new peaks with the passing of each record-breaking day. Keeping pace with this great offensive is Masonite* Die Stock—improved in strength and durability to meet higher and higher production demands.

With its light weight and high compressive strength, this amazing semi-plastic material is saving precious time and cutting down production costs for manufacturers. Masonite Die Stock can be worked with hand tools or power machines . . . will not shrink, crack, twist or warp.

You find Masonite Die Stock at work in great aircraft plants, being used in conjunction with rubber pads for shearing, forming, and shearing and forming in one operation, and also for router templates, drill jigs and assembly fixtures. For thicknesses greater than those available, it can be laminated with cold setting Urea-Formaldehyde glues.

If you are looking for a *practical* material for production dies, investigate Masonite Die Stock. It comes in thicknesses of ¼ to 4 inches . . . in sizes of 48 x 72 inches and 48 x 144 inches. For further details fill out and mail the coupon below.

*TRADE MARK REG. U. S. PAT. OFF. "MASONITE" IDENTIFIES ALL PRODUCTS MARKETED BY MASONITE CORPORATION. COPYRIGHT 1943, MASONITE CORP.

MASONITE CORPORATION Dept. TE-2, 111 West Washington Street, Chicago, Ill.

Please send me illustrative literature and complete information about Masonite Die Stock.

Name and firm _____

Address _____

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With Their Help We'll Win

These women, machining precision parts on South Bend Lathes in a vital war plant, are typical of thousands of women who are doing their part to win the battle of production.

With eager hearts and nimble fingers, thousands American women are working shoulder to shoul- with men in vital war industries — replacing se who have left their machines to defend their ntry. And they are doing a fine job of filling n's shoes, for they know that the battle of pro- tion must be won to keep their men at the nt supplied with the guns, planes, tanks, bullets, d thousands of other things an army must have be victorious.

Women learn to operate South Bend Lathes in surprisingly short time. Not that just any girl n become an expert machinist or toolmaker over ht. But on certain classes of work — the kind of rk you would expect a beginner to do — women highly successful.

Quick to appreciate quality, women like South Bend Lathes. They like the fully enclosed design with no exposed pulleys, belts, or gears — the smooth operation of conveniently placed controls — the absence of rough edges and sharp corners that might catch their clothing — the dependable precision that enables them to turn out maximum production, even when extremely close tolerances are specified. And, most of all, they appreciate the ease of operation which reduces fatigue to a minimum and seemingly shortens the work-day by hours.

South Bend Engine Lathes and Toolroom Lathes are made in four sizes, 9″ to 16″ swings. South Bend Turret Lathes are available in three sizes. Write for information, specifying size and type of lathe in which you are interested.

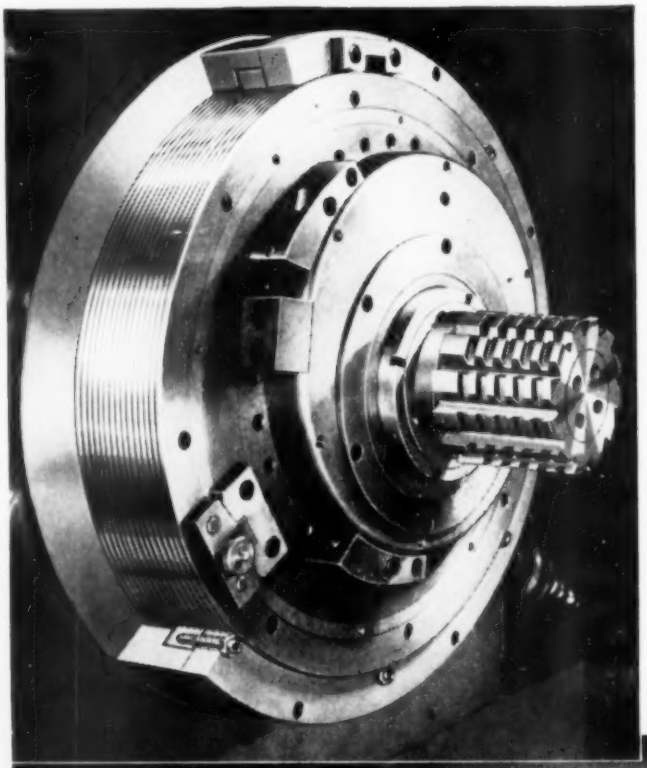
"HOW TO RUN A LATHE"

A valuable handbook for apprentice training. Explains the operation and care of engine lathes. 128 pages — 365 illustrations. Sent postpaid for a 25c War Stamp.

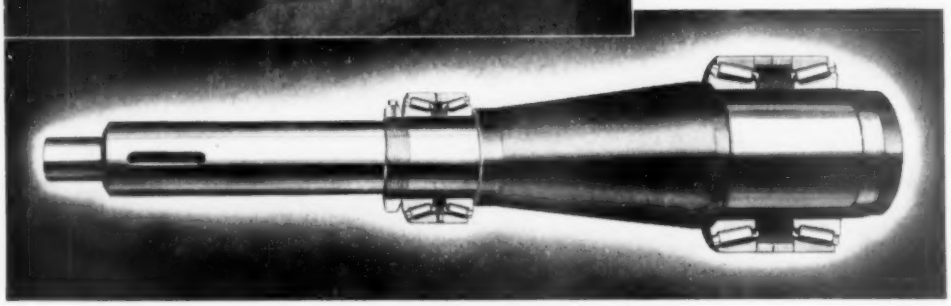
SOUTH BEND LATHE WORKS

SOUTH BEND, INDIANA — LATHE BUILDERS FOR 34 YEARS

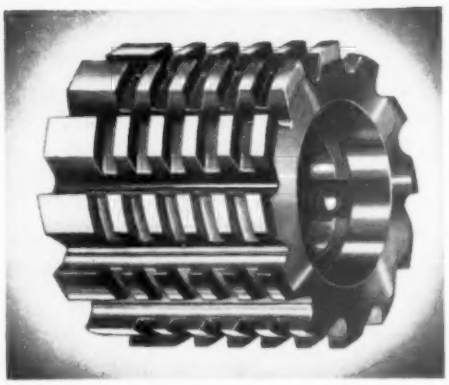
The PLAN-O-MILL *is Accurate!*



ONE big reason why Plan-O-Mill form and thread milling machines are obsoleting older and bulkier equipment is their ability to *produce*. But alongside Plan-O-Mill's amazing production record is a standard of accuracy that many slower, less productive machines are unable to attain. Extra large LEAD SCREW, shown in cutaway view at left, insures extreme thread accuracy—yet even the largest threads are plan-o-milled with a single pass of the cutter!



● The massive Plan-O-Mill SPINDLE (above) revolves on pre-loaded bearings, carries the cutter on a true, vibrationless path. Plan-O-Mill THREAD MILLING CUTTERS (right) are made with the same regard for precision that is evident throughout Plan-O-Mill manufacture. For more information on how Plan-O-Mill can do your threading and form-milling job better, faster, and more accurately, contact the Plan-O-Mill dealer nearest you. See list at right



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MILLING MACHINES
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MILLING CUTTERS

o Win the Production Battle

—"there are five things to do:

1. Put all the machines to work. 2. Work all of the machines all the time. 3. Use the most efficient methods. 4. Build an adequate working force. 5. Keep the working force at work." —*Factory Management & Maintenance.*

DAVIS BORING TOOL DIVISION
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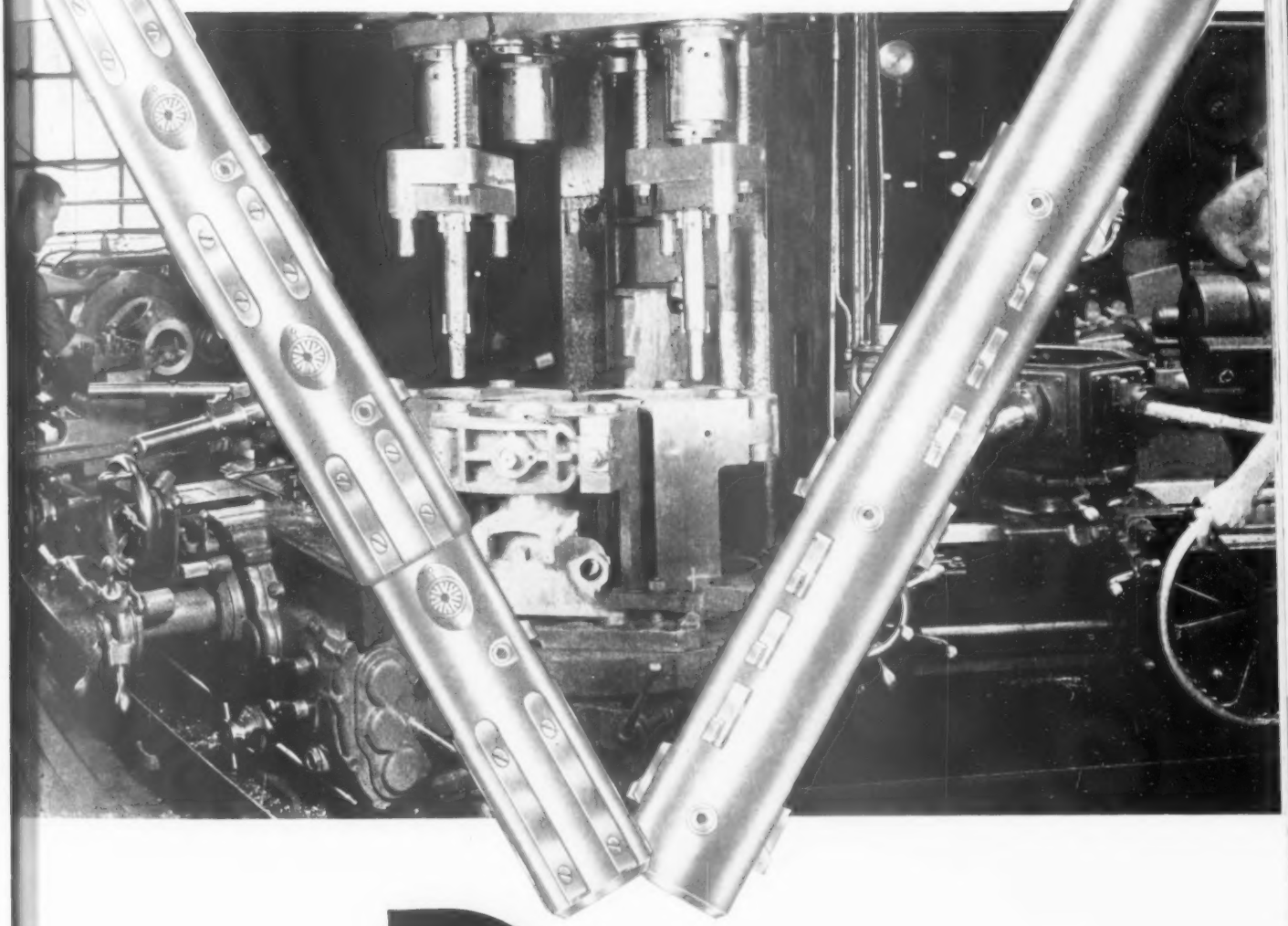

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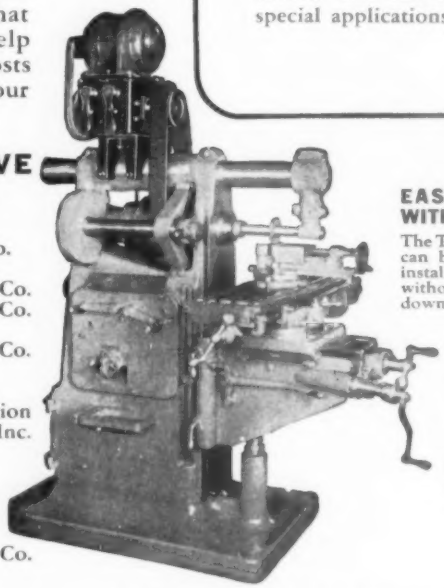
UNI-DRIVE
Motorizes Machine Tools

Makes a Real Fighting Tool

For Lathes, Milling Machines, Shapers, Turret Lathes, Radial Drills, Boring Mills, Hobbing Machines and various machine tools... also Browne & Sharpe and Cleveland Automatic Screw Machines. Can also be adapted to many special applications.

INCREASE YOUR PRODUCTION CAPACITY 25% TO 300%

● This is no time to waste time... America and her Allies, fighting side by side all over the world for the preservation of the United Nations and freedom, have a job to do... *and fast!* Enlist the aid of Turner Uni-Drive units in your plant and you'll at once find what *a real fighting tool you have in your organization* to help you speed up production... keep down power costs ... eliminate costly overhead counter shafts. See your dealer today or write us for full information.



EASILY INSTALLED WITHIN 2 to 4 HOURS

The TURNER UNI-DRIVE can be quickly and easily installed within a few hours without completely shutting down your shop.

Now successfully used in many of America's largest defense plants. Guaranteed for 1 year against defects in workmanship and materials, and sold subject to return for full credit within 60 days if not satisfactory.

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THE TURNER UNI-DRIVE COMPANY

(Sales Division: Turner Machinery Co.)

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NOW AT WORK FOR VICTORY ★★★

PRODUCING MACHINE TOOL DRIVES • ORDNANCE TOOLS • AIRCRAFT FITTINGS

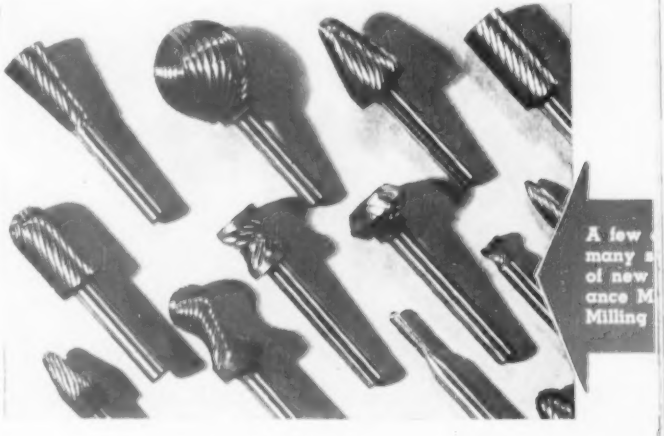
PRECISION REGRINDING BY NEW TOOL CRAFTSMEN

Here at Severance Tool Company worn tools and new tools are both ground by the same skilled craftsmen. The perfect cutting edges that insure clean, sharp bites with new Severance tools are put into worn tools by our regrinding service.

After being accurately reground, your renewed tools are further improved by the Severite Heat-treat hardening process which hardens the teeth of a cutter increasing the life from two to five times.

Severance regrinding saves you 80% of the cost of new tools and, in addition, helps keep your production line at top speed by offering 72 hour service. Your renewed tools are shipped within three days of the time they are received at any of the Severance plants.

It will pay you, as it is paying scores of other manufacturers, to use the Severance Tool Regrinding Service.



Severance MIDGET MILLING CUTTERS AND PRECISION REGRINDIN

for LESS SCRAP in your plant and more "Scrap" on the fighting front!

TUNGSTEN CARBIDE tipped standard reamers by Super Tool are the best that money can buy—and the most economical from every point of view.

They cut faster, cleaner, truer. They save time and reduce scrap—hold their size over extremely long runs—give you more production, and speed the stuff out to our fighting men.

Many standard sizes in stock for quick delivery—in semi-finished form for completion to your sizes. Send us your inquiries and ask for Bulletin R-1.

SOLID TYPE

Straight Shank Taper Shank

SUPER TOOL CO.

21650 Hoover Road
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Carbide Tipped Tools

FOR TURNING • FACING • REAMING • SPOTFACING • BROACHING
FORMING • GRINDER RESTS • WEAR PARTS • BORING • MILLING • DRILLING
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AUTOMATIC CHUCKING EQUIPMENT

. . . Steps up Defense Production

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Proved and demonstrated for fast production and accuracy on parts for peace-time needs, POTTER & JOHNSTON equipment was ready for the urgent needs of Defense industries.

For example, P&J machines are contributing to the realization of unprecedented output of airplanes, aircraft engines, tanks, Bofors guns, anti-aircraft guns, machine guns, adaptors for shells and the American-made Oerlikon gun.

Potter & Johnston is utilizing every facility to help speed the war effort. We are indeed happy to be able to place our many years experience in the development of automatic chucking equipment at the disposal of our armed forces through the metal working industry.

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Besly Taps in greater volume but they must be good Taps

We are increasing production at a remarkable rate but not at the cost of quality. Now or after the present emergency remember Besly when you want low cost tapping operations.

If modern equipment, careful supervision and inspection, knowledge of proper design and constant research can give it to you, BESLY TAPS will be your choice.

Send for a copy of Besly Tap Catalogue, containing many valuable reference tables and other instructive information.

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FACTORY: BELOIT, WISCONSIN

Increased Production

with Gulf Cutting Oils

is the usual result!

Let a Gulf Lubrication Service Engineer demonstrate how these quality cutting oils can improve your machining practice.

UP to 100% greater production, up to 1000% longer tool life, better finishes on the work —these are the results obtained with Gulf Cutting Oils in plant after plant.

Engineered for the production requirements of *today*, Gulf Cutting Oils combine the best possible lubrication and effective cooling in the cutting and tool-chip contact areas. In practically every case, machine tool performance and work finish are greatly improved with these specially prepared cutting oils on the job. Improved chip quality and shape reflect improved cutting to experienced operators.

Let a Gulf Lubrication Service Engineer demonstrate — in *your* plant — how Gulf Cutting Oils can help you get improved machining practice and increased production.

For additional information on Gulf Cutting Oils, send the coupon below.

GULF INDUSTRIAL LUBRICATION

Gulf Oil Corporation · Gulf Refining Company TF
3800 Gulf Building, Pittsburgh, Pa.

Please send me, without obligation, a copy of the new booklet, "Gulf Cutting Oils," which includes a 24-page Machining Guide.

Name _____

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BOUT of the O'TOOLS...TIME OUT FOR AXIS KNOCKOUTS

Want to oil the skid for the Axis?

MOST important of the pointers on the care of AIR Grinders and Drills is: *Watch your lubrication!* By frequent and regular use of the proper oil and grease, you can oil the skid for the Axis these ways:

1. You get greater production from the tools.
2. You minimize tool maintenance costs.
3. You increase tool life, saving critical materials vital to the war effort.

All the facts on the oiling and greasing of AIR grinders and drills are given on Pages 3, 4 of our booklet, "Keep 'em Running". This complete tool maintenance guide gives practical tips applying to all makes of tools. Salient points also are given on a handy wall chart. A similar conservation plan is available for HIGH-CYCLE tools. State your wishes. No obligation.

Did you know this about AIR tool lubrication?

Special pneumatic tool oils should be used regularly.

Air line lubricator should be used for small tools without reservoir.

Oil reservoir of tools should be filled once each shift.

Lubrication adjustment can be checked from time to time by holding paper over tool exhaust.

Bearings should be washed and repacked with good, light grease every 2 or 3 months of one-shift operation.

These and other pointers are explained in the Rotor AIR Tool Conservation Plan. Free on request.

THE ROTOR TOOL CO.
CLEVELAND, OHIO
AIR
HIGH CYCLE
UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

Turning Time Reduced...

...FROM 17 MINUTES TO 7 MINUTES

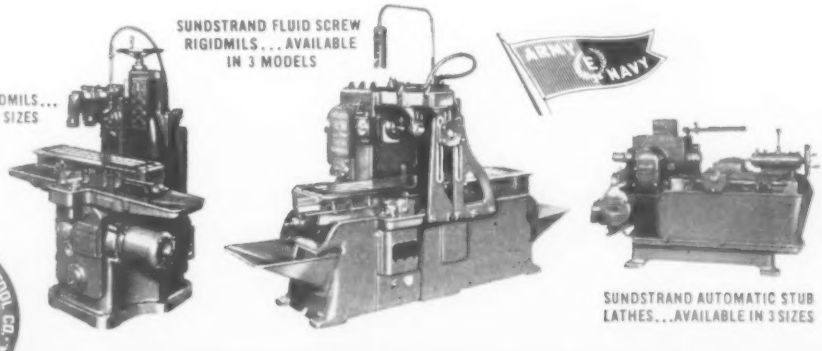
on Aircraft Engine Parts

Nine different sizes of these airplane propeller shaft sleeves, each requiring a different set-up, are turned on this Sundstrand Automatic Lathe. Lots are relatively small, only 200. Yet, with the quick cycle set-up, a feature of this machine, short run work requiring different set-ups is practical and productive.

SET-UP CHANGE-OVER IN LESS THAN 30 MINUTES is possible for most operations on Sundstrand Automatic Lathes. With this feature you obtain the advantages of a fast automatic operating cycle, high rapid traverse rate of 250" per minute and multiple tooling for your *short run work.*

EASY TO OPERATE...unskilled help can consistently produce work at close limits with a Sundstrand Lathe. The operator merely changes work pieces and starts the automatic cycle. Usually one operator can handle two or more machines.

Consider these features of the Sundstrand Automatic Lathe for your short run work before investing in slower general purpose equipment. It is available in 3 models.



SUNDSTRAND AUTOMATIC STUB LATHES...AVAILABLE IN 3 SIZES

QUICKER SET-UP FOR SHORT RUN

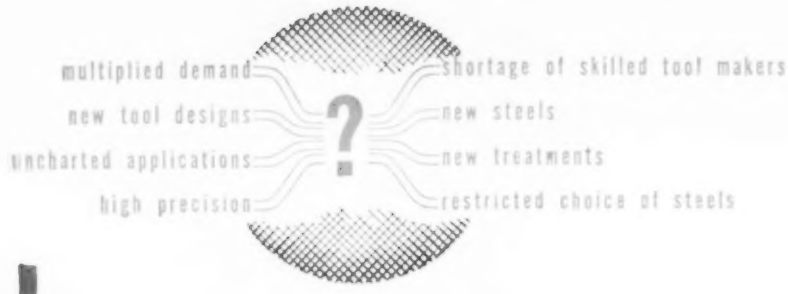
• Sundstrand Automatic Lathes r on cycles of rapid approach, fee quick return of 250" a minu These are set up quickly a changed over easily by adjustir dogs on a graduated disc, as i dicated above. No cycle contr cams required.

HOW SUNDSTRAND ENGINEER PRODUCTION CAN HELP YOU PRODUCE MORE

Sundstrand engineers are available to m recommendations on productive machin Having wide experience in milling and turn makes it possible for them to suggest char which increase production...lower cost. this service freely. Send complete informa with inquiry.

HOW TO TURN SHORT RUN WORK FASTER is illustrated in this booklet describing Sundstrand Automatic Lathes. Twenty-two front and six rear carriage cycle diagrams are also illustrated. Write for your copy today. Ask for Bulletin 809.

SUNDSTRAND MACHINE TOOL CO.



Aid on wartime tool steel problems

Top speed war production demands TOOLS — *more* tools than dreamed of in peace time — *new kinds* of tools for new war time jobs. The tool industry is tackling this tremendous task short of skilled tool makers and restricted by shortages in their choice of steels.

Solutions to these new problems are being worked out every day by the tool industry. Frankly, we don't have all the answers but our contacts with American tool makers determined to win this war puts us in a position to assist you in finding solutions to some of the particular problems that may be facing you.

On your problems of steel selection and treatment of tool steels, we would be very glad to have you get in touch with us. For your convenience, we are listing below the addresses of our district offices.

COPPERWELD STEEL COMPANY · WARREN, OHIO

COPPCO TOOL STEELS

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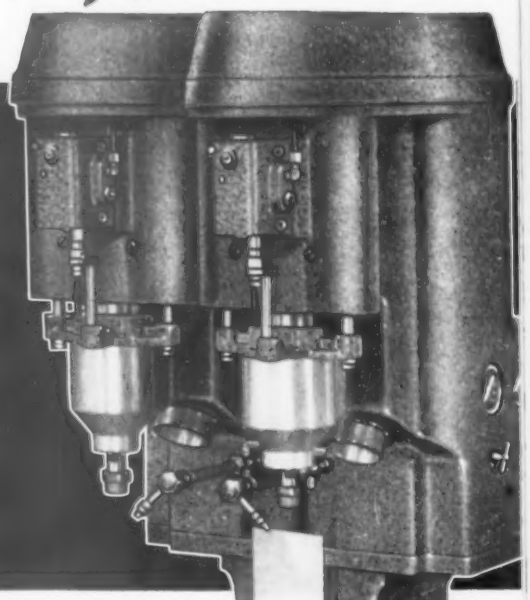
NEW YORK	117 Liberty Street	Cortlandt 7-8314

Tips for faster, more accurate Tapping!



FOR TAPPING TWO HOLES in one piece, a Haskins Two Spindle Tapper—with *Piece Part Control*—substantially speeds up production.

In the operation above (aluminum fuse bodies), two holes of different sizes are tapped by one operator, on one machine.

Parts are placed in the fixture, pressed against pins operating micro switches and—*air does the rest.* With both hands free, the operator can handle parts faster—much faster. Everything else is automatic.

The accuracy of the work is constant—uniformly controlled by air! That's why there is no tolerance problem on Haskins Tappers. Why each part is tapped *exactly* like each other—to Class 4 fit when necessary.

Tapping the Haskins way is faster, definitely more accurate, definitely less costly. R. G. Haskins Company, 2756 W. Flournoy St., Chicago.

AIR Control

HASKINS

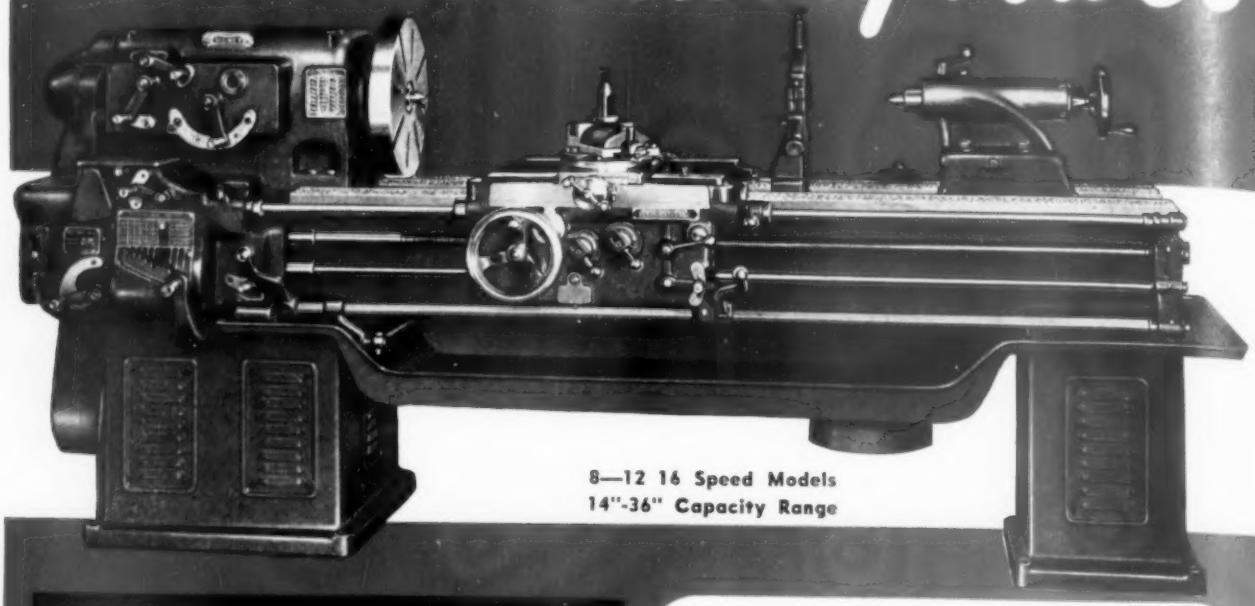
Precision

TAPPING EQUIPMENT

HASKINS

FOR ADDITIONAL TAPPING TIPS send for our latest literature, devoted largely to war work. Gives many money-saving, money-making ideas. Free on request.

Smooth Flowing Power



8—12 16 Speed Models
14"-36" Capacity Range

Sidney Lathes

• The Accuracy and smooth finish essential to high production war work is assured by the smooth drive mechanism on Sidney Lathes.

The pulley, mounted on pre-loaded anti-friction bearings, is full floating on a sleeve bolted to the headstock to eliminate deflections of the drive-shaft because of belt pull.

The clutch is built for heavy duty service, is of toggle action type with single point adjustment. Clutch is equipped with gear tooth driving plates. The friction discs, back plates and floating plates are suitably finished to insure smooth, positive operation.

Thus you get a smooth drive with resultant smooth finish on the work.

Bulletins covering all models available at your request.

SIDNEY
THE SIDNEY MACHINE TOOL CO., SIDNEY, OHIO, U.S.A.

The SIDNEY MACHINE TOOL Company

Builders of Precision Machinery

SIDNEY — ESTABLISHED 1904 — OHIO

A Vital Message

TO EVERYONE USING MILLING CUTTERS WITH INSERTED BLADES

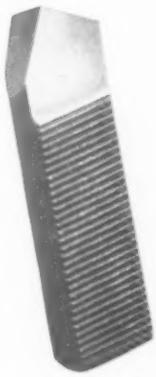
High speed steel is scarce. It is every shop man's duty to see that the supply on hand be used to the limit, and to see that all scrap is returned to the steel mills.

Lovejoy type "A" Milling Cutters were designed to utilize more than half the length of Lovejoy Blades. This is accomplished by Lovejoy's exclusive positive-locking device which holds short blades as rigidly as new blades. Be sure to take advantage of this feature — not only to help your costs and production, but also to help Uncle Sam.

When your Lovejoy Blades have been used to the limit, then order new blades out of our stock. Lovejoy High Speed Steel, Stellite, Rexalloy and Cemented-carbide blades in all standard sizes are ready for immediate shipment.

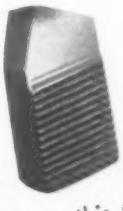
★

Often worn out Cemented-carbide blades may be salvaged by retipping — ask about this new Lovejoy service.



NEW
A new Lovejoy blade

SAVE
Still plenty of life left



SCRAP
Sell blades like this to Uncle Sam — he needs them

LOVEJOY
TOOL COMPANY, Inc.
SPRINGFIELD, VERMONT, U.S.A.

ILLINOIS

DESIGN

TIGH

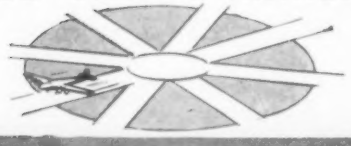
BOU

effective solution.

★ ★ ★

"Illinois" has these important tool de-
sign essentials . . . and, exceptiona
production facilities as well. A discus-
sion of your particular problems wit
our engineers will prove it!

OVERNIGHT TO ALL AMERICA
FROM THE HUB OF AIR TRANSPORTATI



ILLINOIS
TOOL WORKS

MANUFACTURERS OF METAL CUTTING
TOOLS AND SNAKEPROOF PRODUCTS

2501 N. Keeler Avenue, Chicago, Illinois

In Canada: Canada, Illinois Tools, Ltd.
Toronto, Ontario

HOBS • BROACHES • SHAPER CUTTERS • GEAR CUTTERS

Where
STANICUT
OILS
Are Used

t 107 BC is designed
speed automatic work
cutting steels and can be
copper and brass, with-
ger of staining the work.
o suitable as a coolant

WAR-PRODUCED FOR WAR PRODUCTION

NEW STANICUT OILS

One of these

our jobs better

HTLY

UND

ly a war-born development. They are
machines meet the rigid require-
h at the higher speeds and on the
oday.
rs have spent months in develop-
them to some of the toughest jobs
e still finding it difficult to get
, and tool life call in one of these
ee if one of these new oils—and the
plying them—can help you.
10 South Michigan Avenue, Chicago,
Illinois, for the Engineer nearest you.

stocks, and it gives ex-
t tool life.

★

icut 309 BCS is designed
heavy broaching, threading
tapping soft steels or those
tend to tear easily. This
high in active sulfur, con-
compounding, and acts as
i-flux as well as a coolant.

★

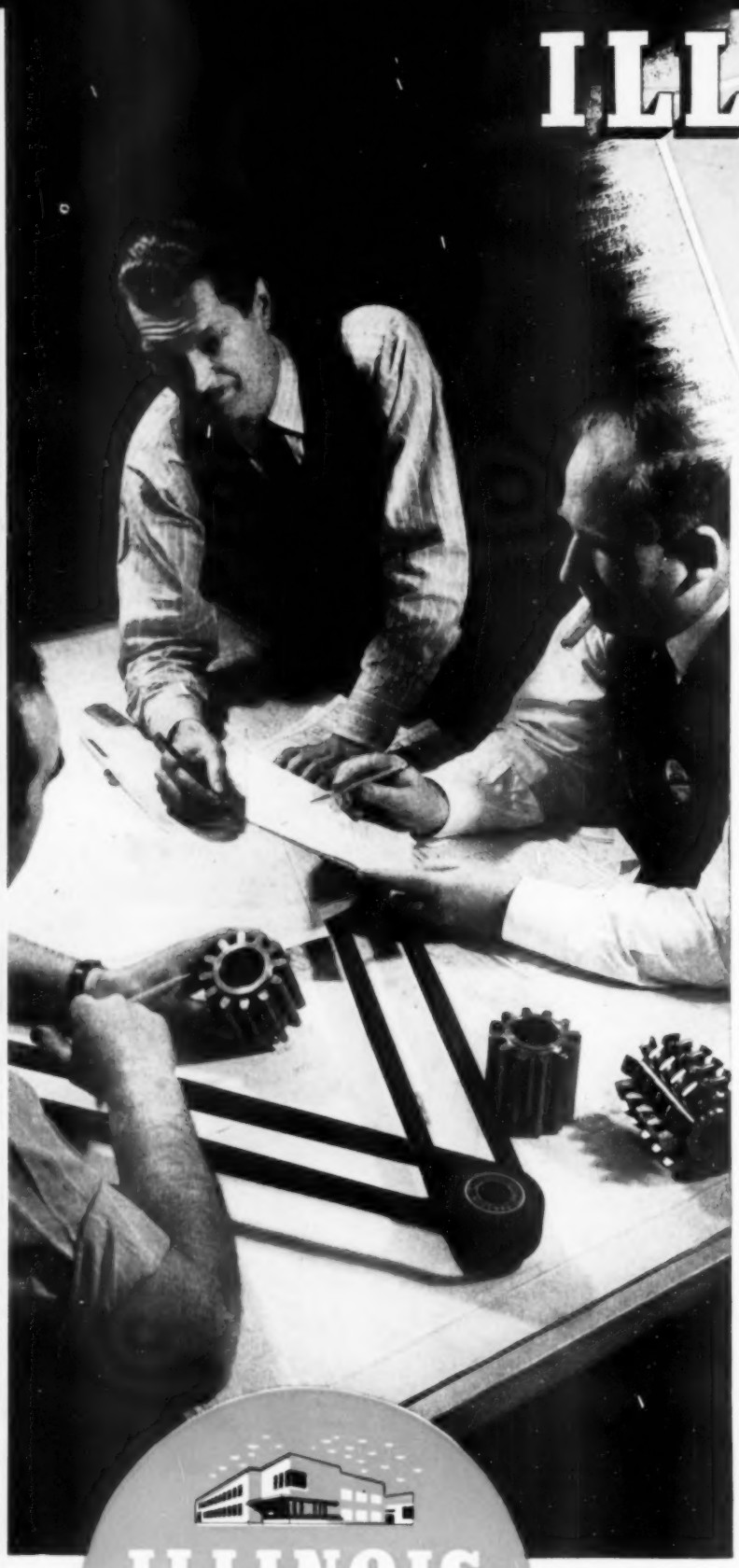
2 typical Stanicut applications

Threading M130 Bomb Fuses—Before Stanicut 126 BCS was used in threading WD1314 steel bomb fuses, thread chasers had to be ground every 500 to 1000 pieces. With Stanicut, 6000 pieces are threaded before regrinding the chasers. Thread quality was also improved.

Machining Aluminum Fuse Adapter—On an automatic operation, tough aluminum-alloy parts are formed, drilled, counterbored, chamfered, and cut off at the rate of one each 10 seconds. Even at this high speed, parts run cool with Stanicut No. 62 FC. Finish and tool life are good. Decreased carryaway on parts and chips has reduced oil consumption one-third.

TANDARD OIL COMPANY (INDIANA)

INDICATION ENGINEERING INDICATION ENGINEERING INDICATION ENGINEERING INDI



ILLINOIS

DESIGN

. . . the expression of

INGENUITY

plus

EXPERIENCE

To create a new tooling principle is an achievement of high order . . . to make its application practical requires the "know-how" resulting from years of experience.

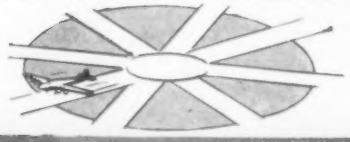
* * *

Your next tool problem may present a need for such abilities. Knowing where they can be found is vital to an effective solution.

* * *

"Illinois" has these important tool design essentials . . . and, exceptional production facilities as well. A discussion of your particular problems with our engineers will prove it!

OVERNIGHT TO ALL AMERICA
FROM THE HUB OF AIR TRANSPORTATION



ILLINOIS
TOOL WORKS

MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS

2501 N. Keeler Avenue, Chicago, Illinois

In Canada: Canada, Illinois Tools, Ltd.
Toronto, Ontario

HOBS • BROACHES • SHAPER CUTTERS • GEAR CUTTERS

Where STANICUT OILS Are Used

...t 107 BC is designed ...h speed automatic work ...utting steels and can be ...copper and brass, with... ...ger of staining the work. ...o suitable as a coolant ...carbide alloy tools are ...

★

...icut 62 FC gives consid...bly better tool life and finish ...n kerosene and lard oil ...ds commonly used for ma...ning tough aluminum alloys. ...ntains no active sulfur and ...be used for machining cop... ...and brass. This eliminates ...ging oil when both alumi... ...n and copper are worked on ...same machine. The higher ...h point decreases the fire ...ard.

★

...icut 155 SC is giving ex...nt results on the tougher ...y steels, especially those ...t tend to "smear" and leave ...oor finish with ordinary cut... ...g oils.

★

...icut 126 BCS was devel...d for machining 1335 and ...ilar steels lower in machin...ity rating than free cutting ...w stocks, and it gives ex...ent tool life.

★

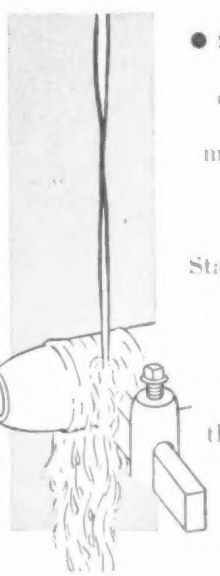
...icut 309 BCS is designed ...heavy broaching, threading ...l tapping soft steels or those ...ch tend to tear easily. This ...s high in active sulfur, con...s compounding, and acts as ...anti-flux as well as a coolant.

★

WAR-PRODUCED FOR WAR PRODUCTION

NEW STANICUT OILS

One of these cutting oils can do one or more of your jobs better



● STANICUT OILS are distinctly a war-born development. They are designed to help tools and machines meet the rigid requirements for accuracy and finish at the higher speeds and on the new alloy metals in use today.

Standard Cutting Oil Engineers have spent months in developing, testing and applying them to some of the toughest jobs in war-plant work. If you are still finding it difficult to get the necessary accuracy, finish, and tool life call in one of these cutting oil specialists. See if one of these new oils—and the Engineers' experience in applying them—can help you.

Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you.

2 typical Stanicut applications

Threading M130 Bomb Fuses—Before Stanicut 126 BCS was used in threading WD1314 steel bomb fuses, thread chasers had to be ground every 500 to 1000 pieces. With Stanicut, 6000 pieces are threaded before regrinding the chasers. Thread quality was also improved.

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STANDARD OIL COMPANY (INDIANA)

NO PLACE FOR "Doubtful Screws"

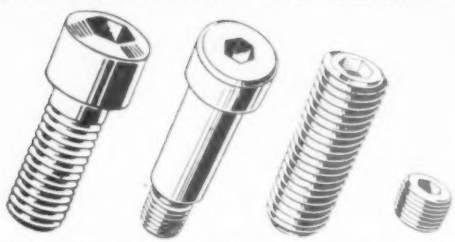
Photo by U. S. Army Signal Corps.

. . in the Mechanical "Brains" of our Fighting Forces . . .

With their own unaided senses, our fighting men could never win a modern war. Precision instruments are their mechanical "brains" . . . searchlights "see" the invisible enemy . . . sound locaters "hear" him hundreds of miles away.

Because it must withstand the gruelling strains of war service . . . because it must not fail in the field . . . this vital equipment can include no "doubtful" materials. The smallest detail must be as nearly perfect as human skill can devise. That is why Parker-Kalon Quality-Controlled Socket Screws are "on the preferred list" of many manufacturers of important war aids.

The unparalleled check-routine supervised by the Parker-Kalon Quality-Control laboratory eliminates the "doubtful screws" . . . screws that *look* all right but fail to *work* right. You can be *sure* of the physical and mechanical characteristics of P-K Socket Screws . . . yet they cost no more! Parker-Kalon Corporation, 190-198 Varick Street, New York, N. Y.



"Quality-Controlled means . . .

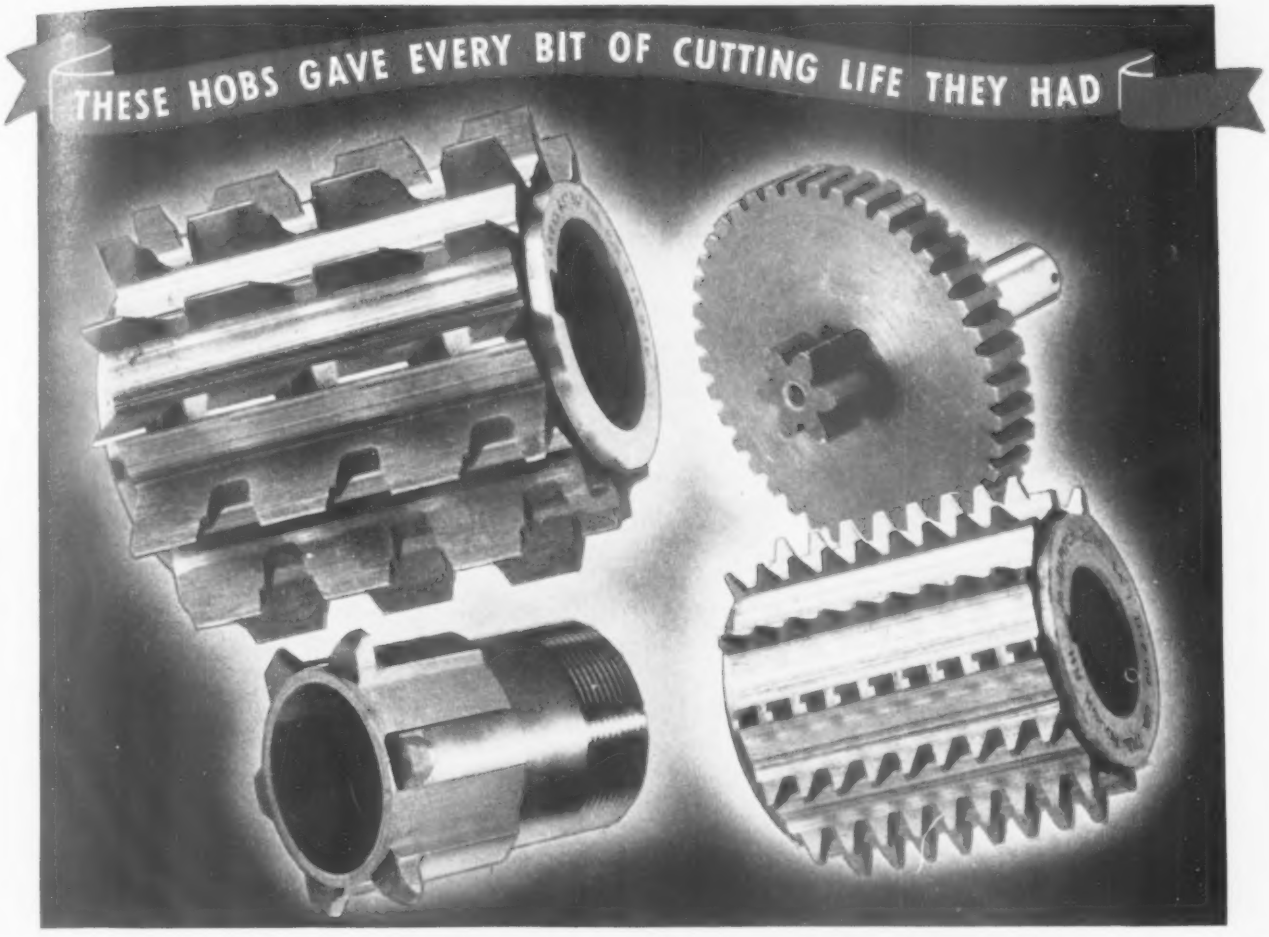
Complete test and inspection covering: Chemical Analysis; Tensile and Torsional Strength; Ductility; Shock Resistance under Tension and Shear; Hardness; Head diameter, height and concentricity; Socket shape, size, depth, and centricality; and Thread fit.

PARKER-KALON

Quality-Controlled

SOCKET SCREWS

Give the Green Light to War Assemblies



Care For Your Hobs–So Their Life May Be Long!

HERE are suggestions for using hobs that will help to conserve their value and obtain maximum cutting life:

1. SHIFT OFTEN. As the hob approaches dullness, shift lengthwise to a new position. Use as many positions as possible for each sharpening, and shift from each position soon enough to prevent excessive wear.

2. SHARPEN OFTEN. Do not allow hob to become excessively dull. By sharpening often, before wear becomes serious, only minimum stock removal will be required.

The less stock removed at each sharpening, the longer will be the hob life.

3. USE PROPERLY. Select feed and speed which do not overload the hob beyond its strength. Do not jam hob into the work with rapid traverse. Select a proper cutting oil for the job which will carry away maximum heat. Keep coolant supply clean.

4. STORE CAREFULLY. Sharp cutting edges will nick or chip if allowed to bang against other hardened cutters. Use the special boxes in which B-C Hobs are shipped, for proper protection in storage. Experienced users of hobs, as a rule, know these precautions well and have observed them for years. But, in war work, less-experienced operators are handling hobs and hobbing machines. It is up to everyone to see that carelessness in the use of hobs does not create a needless waste.

THE PICTURES...

Top, Left. A special B-C spline hob. Used to hob lock nut for aircraft engine starter. Hob gave 4 positions with .010" stock removed per sharpening, for a total of 36 sharpenings.

Bottom, Right. A double-thread, 16-21 pitch B-C roughing hob. Used to hob aircraft engine starter gear shown. Hob gave 4 positions with .010" stock removed per sharpening, for a total of 22 sharpenings. Hob speed, 133 r.p.m.; feed, 0.012" per revolution of work.

Buy WAR SAVINGS Bonds

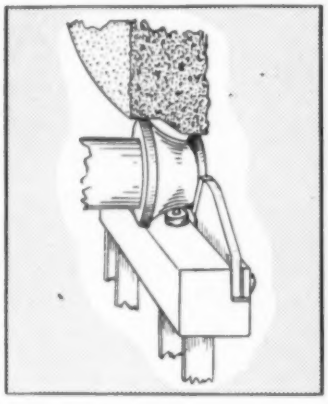
CONSERVE CUTTING TOOLS FOR VICTORY

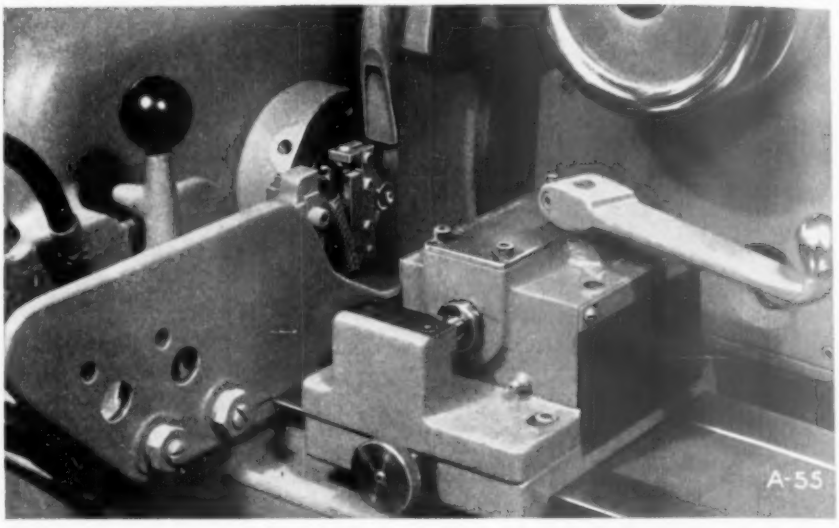
Barber-Colman Company

GENERAL OFFICES AND PLANT • 213 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

To Finish The Job Quicker . . .

LANDIS-SOLEX SIZING ACCOMPLISHES THE UNUSUAL





Within recent months many out-of-the-ordinary grinding problems have demanded solution. The set-up shown above was the Landis answer to one of these.

A bearing manufacturer wished to simultaneously grind the two diameters adjacent to a previously ground raceway, holding them in exceedingly close relationship to the diameter of the raceway. Any slight plus or minus inaccuracy was to be exactly reproduced.

Landis engineers suggested a unique application of the Landis-Solex sizing device and the results have been extremely satisfactory. As indicated by the drawing above, the caliper frame rides on the smaller of the two diameters being ground, while the air outlet is against the raceway. Automatically, and at a high production rate, all raceway diameter variation is thereby duplicated.

Contributing to the outstanding performance of the machine are the many features of the Landis 4" Type H which have made it the preferred grinder in hundreds of America's war plants where high production and extreme accuracy are required. Consider it seriously for your smaller work, whether conventional handling or unusual handling is required.

Unusual Performance As Usual

PRECISION LANDIS GRINDERS

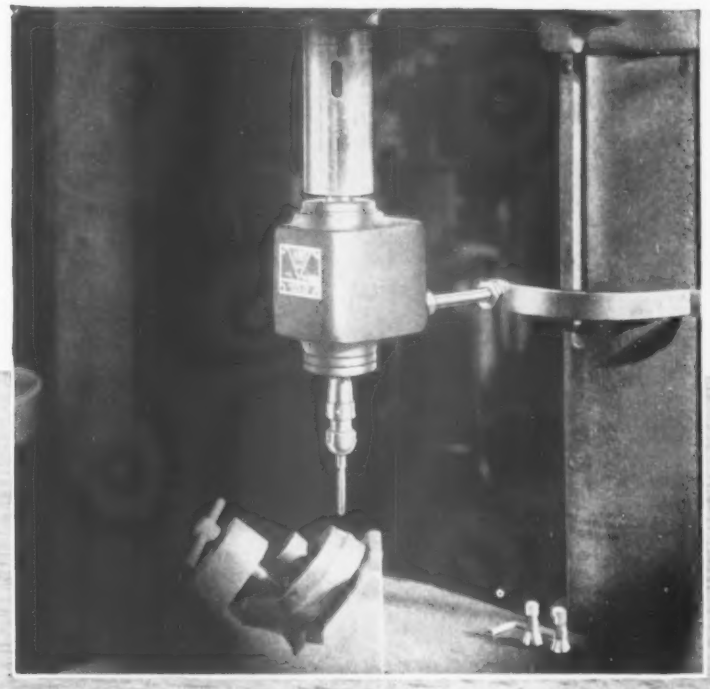
LANDIS TOOL CO. WAYNESBORO, PENNSYLVANIA.

LANDIS EXCELLENCE

CONTRIBUTES TO VICTORY

405

Jarvis POWER TOOLS



CHRIS CRAFT PHOTO

JARVIS TAPPING ATTACHMENTS for high speed production. Built for long, dependable service. Famous for long tap life and extreme accuracy. Send for catalog and specifications for type and capacity.

THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES

Micromatic Anticipates Future

1. Micromatic work holding fixtures assure MAXIMUM EFFICIENCY in GENERATING FINAL SIZE, GEOMETRIC ACCURACY, SURFACE QUALITY and SURFACE FINISH.

2. Micromatic Manually Controlled Hutto-hones fulfill lower production needs with minimized equipment for any amount of stock removal desired.

3. Micromatic Automatically Controlled Microhones are specific purpose tools, for stock removal usually not exceeding .003″ to .004″.

4. Micromatic Hydraulically Controlled Drawfinishing Tools generate final finish with all markings co-directional with the axis of the bore.

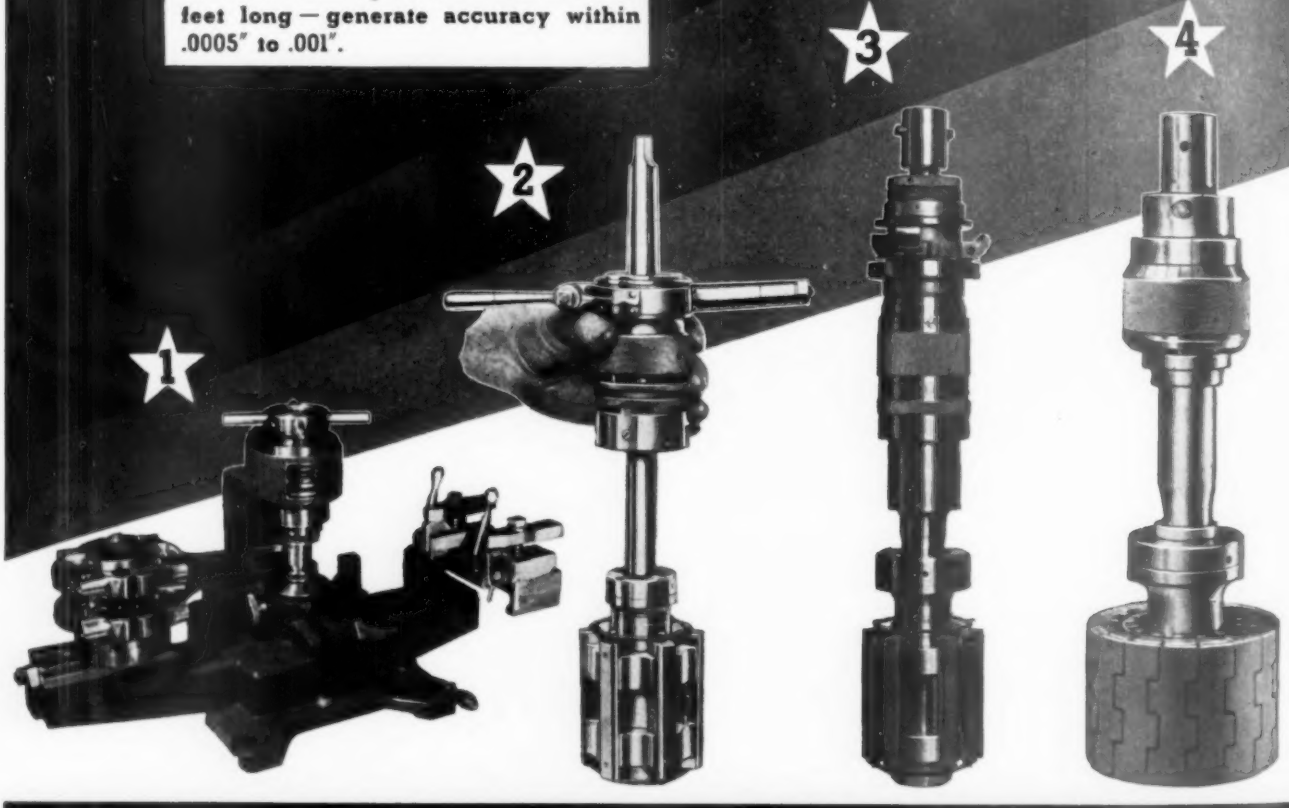
5. Micromatic Hydraulically Controlled Tubing Hones remove from .001″ to .075″ stock in bores up to 30″ diameter x 75 feet long — generate accuracy within .0005″ to .001″.

6. Micromatic Hydraulically Controlled Hydrohones (with or without remote control) remove from .001″ stock upwards in tubing and large diesel liners — generate accuracy within .001″.

7. Micromatic Model 100 Hydrohoner with Automatic Microsize Control and Loading removes up to .002″ or .003″ stock in cast iron bores from ¼″ to 1″ diameter x 6″ long — generates accuracy within .0001″ to .0002″ and size within .0005″.

8. Micromatic Model 200 Hydrohoner removes up to .003″ or .005″ stock in cast iron bores from 1″ to 2″ diameter x 6″ long — generates accuracy within .0001″ to .0003″.

9. Write for Bulletins AR-65 and AR-67.

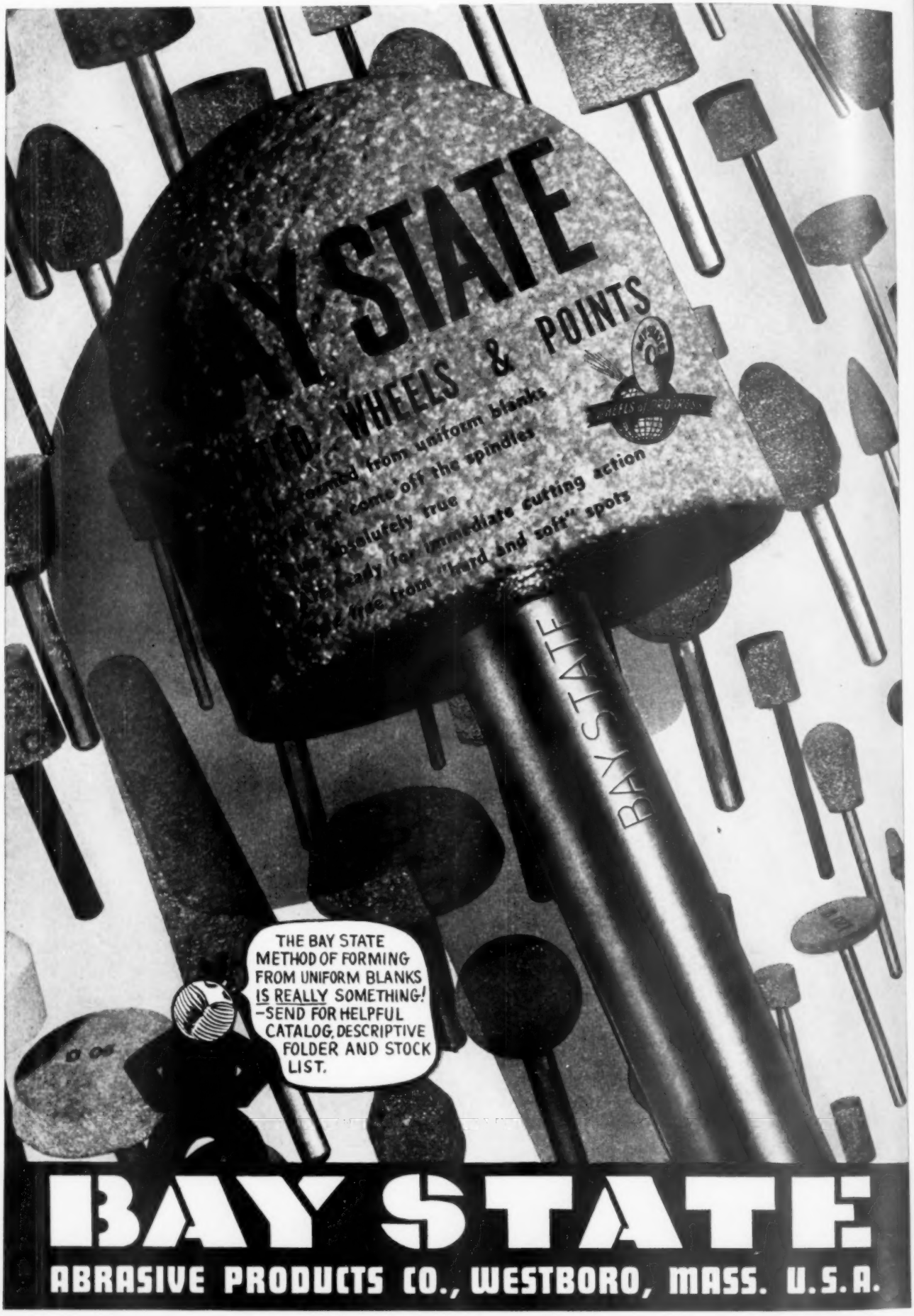


MICROMATIC HONE CORPORATION

Production Honing Needs

MICRO MATIC

1345 E. Milwaukee Ave., Detroit, Mich., U. S. A.


Y STATE
WHEELS & POINTS
formed from uniform blanks
not come off the spindles
absolutely true
ready for immediate cutting action
free from "hard and soft" spots
BAY STATE
THE BAY STATE METHOD OF FORMING FROM UNIFORM BLANKS IS REALLY SOMETHING! —SEND FOR HELPFUL CATALOG, DESCRIPTIVE FOLDER AND STOCK LIST.
BAY STATE
ABRASIVE PRODUCTS CO., WESTBORO, MASS. U.S.A.

a steel knot

ACTUAL PHOTOGRAPH
Speed Case Steel (.20 carbon) 1-inch cold drawn bar tied in a knot, cold, without fracture.

SPEED CASE - SPEED TREAT STEELS

Your steel problem may not include tying knots in open hearth free machining steel, but Speed Case and Speed Treat Steels have solved many knotty problems involving production bottlenecks for many of the nation's largest war producers.

These two steels, employing no strategic alloys, have often reduced machining costs over 50% and doubled production. If your engineering department is not familiar with these steels, our metallurgists will be glad to assist them.

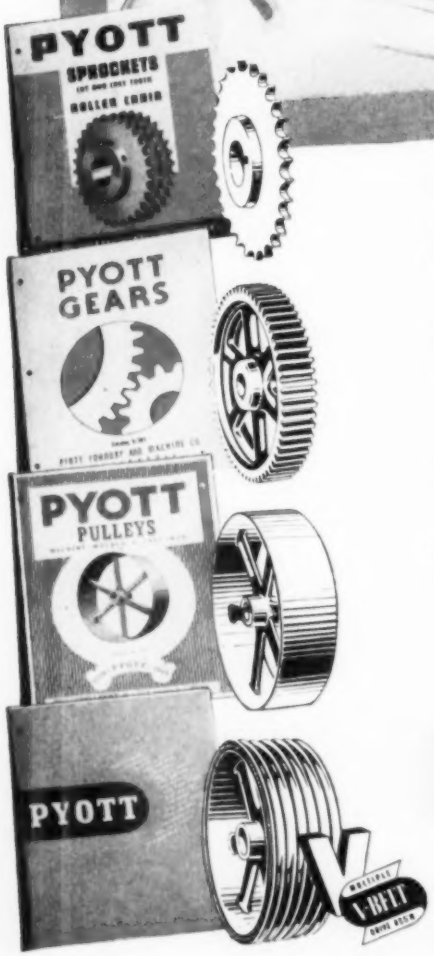
MONARCH STEEL CO.
THE FITZSIMONS CO.
PECKOVER'S LTD., TORONTO, CANADIAN DISTRIBUTOR

INDIANAPOLIS
HAMMOND, CHICAGO

LICENSEE FOR EASTERN STATES
YOUNGSTOWN, OHIO

MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

HE ALWAYS GOES TO TONY'S *Because* TONY BUILT GOOD WILL



IT'S JUST human nature to patronize those who study the needs and preferences of the customer and make business relationships friendly and pleasant by constant endeavor to render real service.

Over 46 years ago, the founders of Pyott Foundry established our policy of treating every customer as a potential life-time "account," deserving attention far beyond the mere skillful execution of their orders.

As a result, we continue to serve today many who first came to Pyott for their castings, gears, pulleys and sheaves—twenty, thirty and forty years ago!

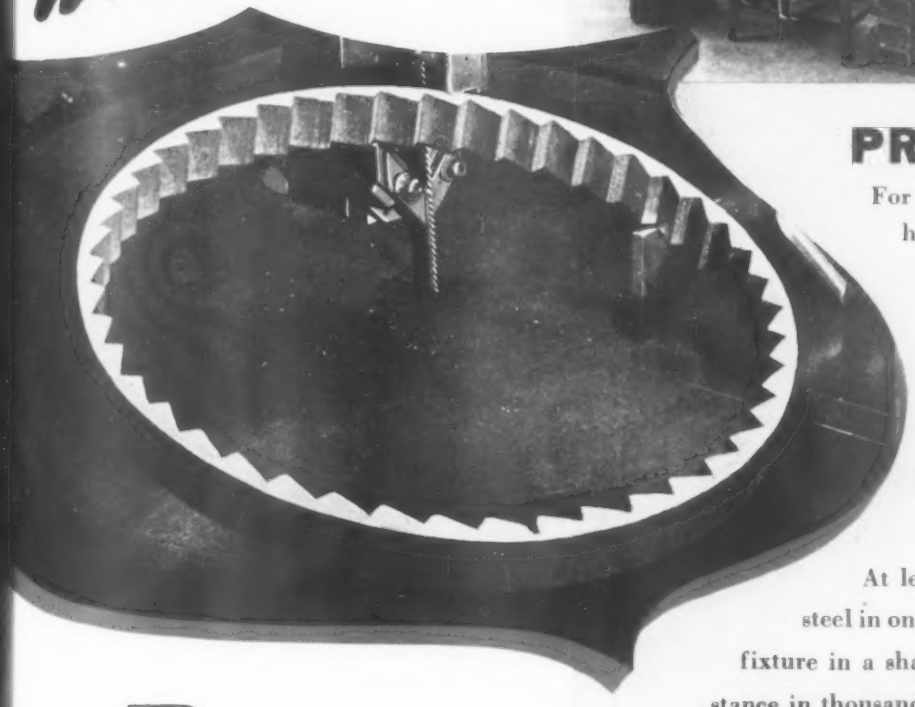
You, too, will find Pyott not only a dependable source of supply but a "human" business institution. We solicit an opportunity to demonstrate what we mean.

The four Pyott Catalogs give complete engineering information and prices on Sprockets, Gears, Pulleys, Sheaves and V-Belt Drives. Any or all are free for the asking. Please use company letterhead when requesting them.

PYOTT

FOUNDRY AND MACHINE CO.
328 N. SANGAMON ST., CHICAGO
CAST IRON AND SEMI-STEEL FOUNDRY WORK

IT BEATS ALL WHAT DoAll WILL DO!



PRODUCTION WORK

For regular run-of-shop jobs, the DoAl handles internal and external cutting with speed and economy. Accurately follows a hairline layout on any meta or alloy—blocks a foot thick, bars flats, sheets or tubing—and no fur ther machining is necessary.

URGENT SPECIAL PARTS

Make them the same day on the DoAll

At left is an Internal Ratchet cut from 1½′ steel in one hour. Formerly it was made on a specia fixture in a shaper and required 4 hours. Just one in stance in thousands.

SEE DoAll WORK

● Actual performance records of the DoAll may sound unreal to some people, but after you see how speedily the hard-toothed blading eats its way through any metal or alloy, you'll want one or more DoAlls for your own use.

Let us send a factory trained man with a DoAll to show you what it can actually do and save in the way of man hours, man power and metal—how it takes the place of shaper, miller and lathe —how it relieves other machines of overload work.

GET THIS FREE BOOK—"DoAlls on Production", a story in pictures showing many valuable short cuts and how man hours are stretched in a large variety of industries. Write for copy.

CONTINENTAL MACHINES, INC.

1304 S. Washington Ave. Minneapolis, Minn.

DoAll offices distribute these machines. They also sell and service Grinders, Gage Blocks, Band Saws and Files, Parts and Acces- See Telephone Directory for nearest DoAll office.

AND, HERE THEY ARE

THE RIGHT SIZE FOR EVERY DEPARTMENT

Each Model with Motor

Under $5000 Under $2500 Under $2000 Under $1500 Under

DoALL GAGE BLOCKS

81-piece sets made in following accuracies:
LABORATORY Set, 2 millionths of an inch
INSPECTION Set, 4 millionths of an inch
WORKING Set, 8 millionths of an inch
Write for data on good deliveries

DoALL SURFACE GRINDER

Finest grinder made for those who require high precision accuracy as to size, flatness and parallelism. Adaptable to wet or dry grinding.

SAVAGE TOOL CO., Savage, Minn.

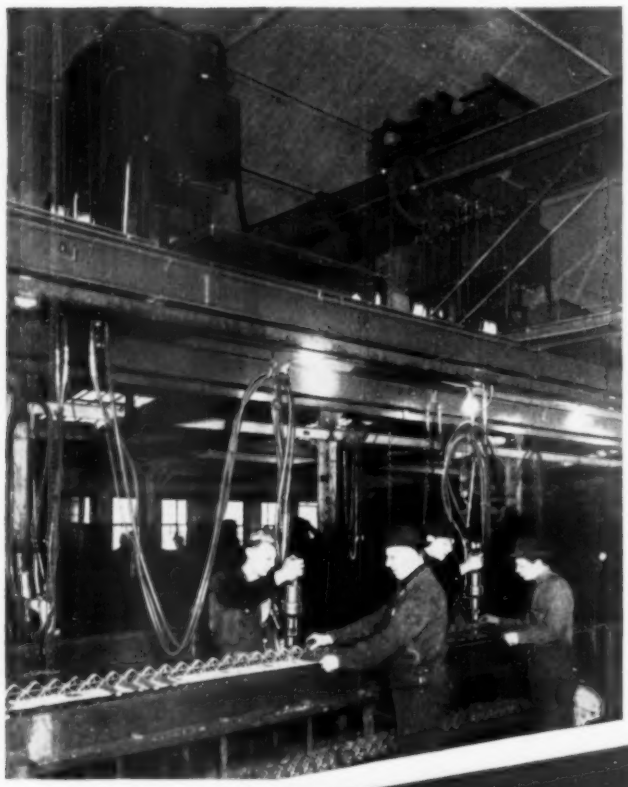
DoALL BAND SAW

Pat. No. 2,255,577
Des. No. 127,313
Other Pats. Pending

Come in easy-to-use Out Boxes. Each box tains 100 ft. of bladin has passed triple inspe

The DoAll Co. Des Plain

"Hy-Power" hydraulic riveters at the plant of Irving Subway Grating Co., Inc. The hydraulic pressure generator units are installed on the balcony, simplifying piping.



Built to take a beating and stand up to it...

HANNIFIN "Hy-Power" hydraulic riveters are providing faster, better riveting on a great variety of essential production, including the "Subway" grating shown here. Commenting on the ability of "Hy-Power" riveters to stand up under continuous service, this user says, "... this equipment has been in service twenty-four hours per day, seven days a week, for over two years, with little or no maintenance costs."

The exclusive "Hy-Power" hydraulic operation combines fast, easy handling and a tighter, more uniform rivet application. The hydraulic squeeze riveting action not only forms a perfect head, but spreads the rivet body to fill the hole better and tighter than is done by other methods. The automatic operating cycle is push-button controlled, with speeds of standard units ranging from 1½ to 3 seconds per cycle, with 3 to 4 inch stroke.

Hannifin "Hy-Power" equipment meets today's needs for fast production, uniform quality of work, and continuous duty. In addition to production riveting, "Hy-Power" equipment is being used for press-fit assembly, punching, and other work involving the application of pressure. Write for "Hy-Power" bulletin No. 53, or consult Hannifin engineers for specific recommendations.

HANNIFIN
Manufacturing Company
621-631 South Kolmar Ave., Chicago, Ill.

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HANNIFIN "hy-power"
RIVETERS ★ PUNCHES ★ PRESSES

PRODUCTION PERSPECTIVES

T.M. REG. U.S. PAT. OFF

LAST-MINUTE NEWS REVIEW OF MASS MANUFACTURING

1943 Program: War production for year will be a "better than $90,000,000,000 job." Two-thirds of nation's output will be aligned behind war effort. Armament may jump 100 per cent. War manufacture value will equal all goods produced in busiest pre-war year. Stumbling block will not be plants and machines, but materials, manpower, transportation, fuel and power.

Plant Expansion: Plan is to use existing factories. Federal budget indicates sharp reduction in expansion, curtailment of new construction. Construction now is at lowest point in 8 years. Since October, WPB has stopped $1,196,000,000 in new and authorized expansion-construction. Difference between 1942 output and 1943 goals will come from full-production in plants now near completion, from conversion of small shops and from concentration of civilian industry....Small Plants: Outlook is brighter. Small War Plants Corp. announced in January that $1,047,-800,000 in contracts had been placed in two months with concerns employing 5 to 500 workers. Gen. Somervell gets credit for aiding efforts to make use of little shops, save thousands of businesses. One result will be healthier post-war production outlook....Concentration: Further elimination of competing civilian output will soon make available new sources of war production. WPB is basing plans for concentration of civilian output on British experience. Products will be standardized, will come from fewer factories. Program already is working in these fields: bicycles, stoves, typewriters, farm machinery.

Materials: Better production scheduling is eliminating material shortages.... Government says all steel is now being used in war program. Steel production and munition-making facilities of U.S., Canada and Britain will be coordinated.... When synthetic rubber will be available for civilian use is anybody's guess. For war use only, official hope is for total of 50,000 tons by summer. Peacetime U.S. consumption of rubber is 600,000 tons annually....As a result of restrictions on nonferrous metals such as tin, copper, nickel and chromium, industrial demands for silver are soaring. Continued Congressional wrangling can endanger supplies of metal now going into solders, brazing alloys, aircraft engine bearings, electroplating and electrical uses.

Manpower: Question for 1943: Can voluntary approach to manpower problem be made operative in time to avoid serious trouble? To keep the wheels turning, War Manpower Commission says some 5,000,000 people not working for gain must enter factories, 2,800,000 others must be drawn from non-war work. Situation still is in "estimating" phase. McNutt believes improved techniques, longer hours will supply equivalent of 1,500,000 workers in 1943....The labor freezing plan, first applied in the Detroit area, now blankets 500,000 Southern California war workers. Cause: Disorderly shifting of workers and labor piracy resulting in disrupted production schedules.

WPB Background: If you're in war production, WPB is your boss. Last month that agency was one year old. Top Man Donald Nelson has weathered the storm, spun industry's wheels as never before. He stood ground, gave ground, replaced virtually every top man in WPB. Chief aide to Nelson is General Electric's Charles E. Wilson, now speeding airplane output. He refused to build more plants for Army---found facilities were operating only 61 per cent of capacity on two shifts because of poor scheduling. Production in those factories is now nearer capacity.

Tool Conservation begins in the Tool Crib

This Tool Sharpening Department under the supervision of an experienced tool engineer assures that every tool in the plant's cribs is in excellent condition.

GET ALL THE *Good* OUT OF *Good Taps*

This grinder located in a tool crib of a large aircraft engine plant is used for emergency sharpening and "touch-up" jobs.

Maintenance of tools in proper working condition multiplies their life many times. Even those which have become badly worn, rusted or chipped — that seem to have outlived their usefulness — may often be salvaged to give valuable additional service.

Many large plants maintain separate tool sharpening and salvage departments. But the small shop or departmental tool crib may easily do an outstanding job if equipped with a small grinder and a few attachments.

• • •

For helpful information on how to keep taps at peak efficiency, send for *"Greenfield's"* new booklet, "How To Sharpen A Tap."

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MACHINING TURBINE BLADES

Finished turbine blades are tough, precisely shaped from a non-corrosive, austenitic steel. Given the task of manufacturing them, Allis-Chalmers engineers reduced the job to 19 broaching, grinding and milling operations.

Allis-Chalmers Photos

Lug, 3/16-inch square, broached on end of blank, is used in following operations for locating the workpiece. Finished to .0005-inch limits, they are gaged upon completion in that all further accuracy depends on them. In broaching non-corrosive steel, Allis-Chalmers engineers recommend cuts of at least .001-inch per tooth to prevent tendency to work harden.

Serrations which key the butt end of the blade to the turbine spindle are form-milled. Both sides are milled simultaneously and are fed on a horizontal radius between opposed cutters revolving counter to each other. Depth of cut is .145-inch. Because serrations are designed for a .0005-inch clearance, heavy jig and fixture are required to hold to tolerance.

JEROME WILFORD
MANAGING EDITOR

WHEN TOOL ENGINEERS at one of the Allis-Chalmers' plants in Milwaukee were given a block of non-corrosive steel from which to machine turbine blades for cargo ships, a major problem was posed for them. In the first place, the material showed a Brinell hardness of 190 to 220. Machineability for this particular alloy is considered difficult because of its toughness. It had been selected because it would resist erosion and corrosion and hold its shape when subjected to super-heated steam temperatures of approximately 950°F. It also has to resist centrifugal forces when operating day in and day out at approximately 6,000 r. p. m.

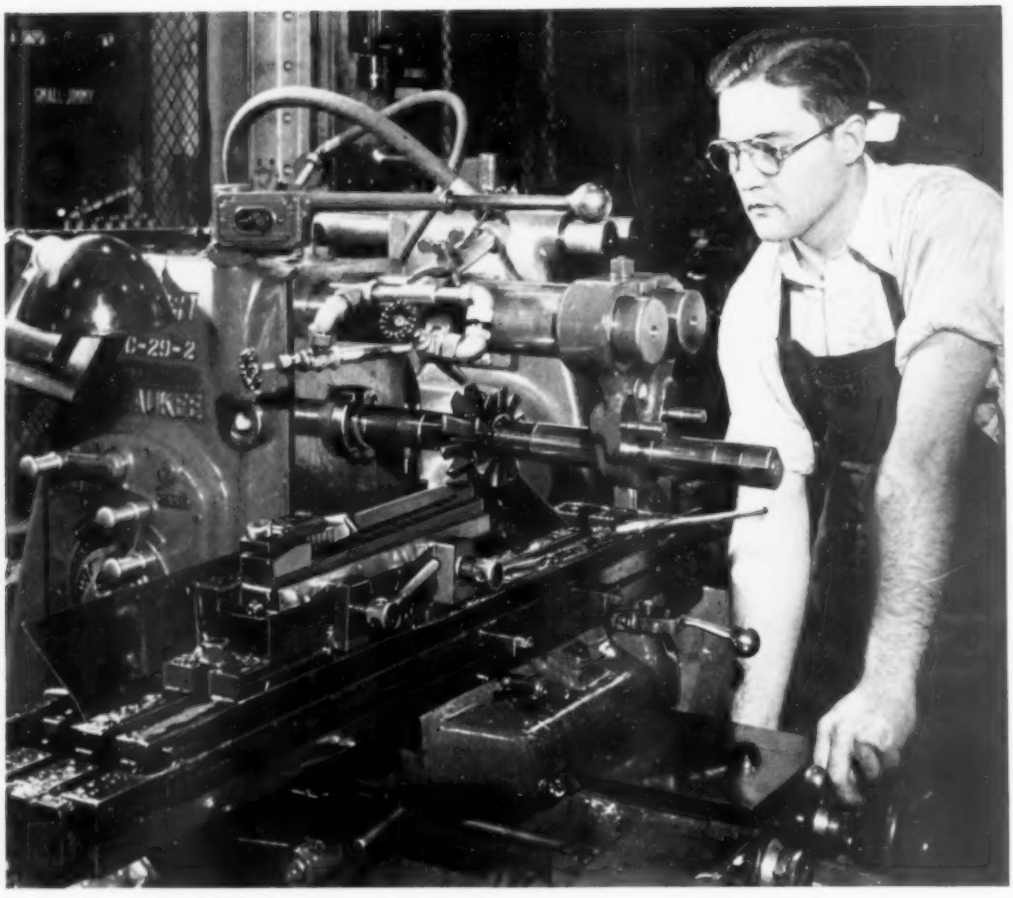
All in all, this block of metal which has qualities for operating under temperatures approaching 1000°F. also has qualities of resistance to machining the contours required to do its share of developing the finished turbines 8500 hp rating.

Precision required

Design specifies close limits — such as .0005-inch clearance where serrations on the blade root end are locked into the spindle. A blade with excessive clearance between serrations and spindle groove would in time cause failure in blading. Design also calls for machining a concave and a convex surface from opposite sides of the block, and the center lines or axis are not parallel.

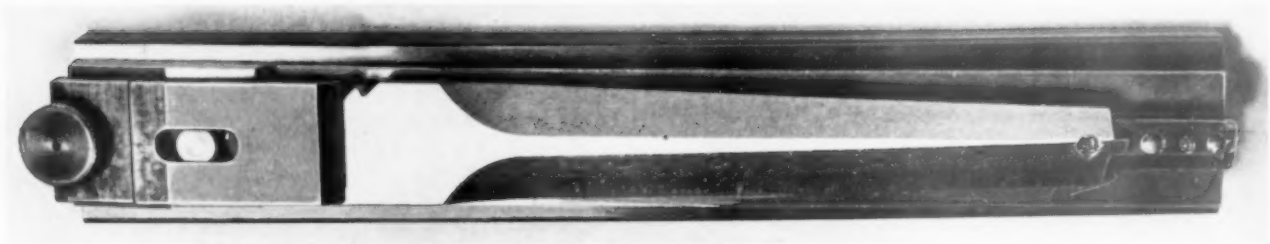
So that it might transmit the maximum in power — get the most from the steam's pressure — every curve and taper has to be in exact relation to the rest of the blade. This means that location of the workpiece throughout operations has to be nearly perfect, and whatever locating devices are employed must always hold the work piece within less than the finest single machining limit. Solution of this problem furnished one of the most remarkable aspects of the finished tooling job.

When the lineup of a series of 19 machining operations to produce finished turbine blades was complete, Allis-Chalmers' engineers had met the obstacles which design and material furnished. They produced a sequence of tools and operations that would



Left:
Bevels are straddle milled preparatory to form milling convex surfaces. For the series of milling operations required to produce this contour, the work-piece is secured in a cartridge which is clamped to the table.

Below:
Cartridge with unfinished turbine blade inserted is used for milling operation for producing convex surface. Problem was to design a jig which would hold workpiece securely, yet allow cutter clearance. Note how locating lug fits slot at one end of cartridge, assuring location to .0005-inch limits.



turn out the finished product with efficiency and economy.

Operating procedure

Heavy fixtures and jigs were employed to hold the workpiece as much as possible against a tendency to warp and spring. Succeeding operations were designed to compensate in depth of cut wherever possible for warp and spring, which on previous jobs produced dimensions in excess of limits.

Operation number one produces blanks from bar stock on an abrasive cut-off machine. After finishing four sides by broaching, next comes what is perhaps the most important single operation, broaching a lug or tenon on each end of the blank which is used in all following operations for locating the workpiece. About 3/16-inch square, the lugs must be finished to within .0005-inch limits. They are gaged immediately upon completion, in that all following machining on this tough steel depends for accuracy on them. This method of location prevents the accumulation of error which is always possible when locating from surfaces which in turn were produced by location from other points.

Broaching the tenons offers one of the first lessons in machining non-corrosive steel. Usually considered an alloy next to impossible to broach, Allis-Chalmers' engineers have discovered the necessity of taking fairly deep cuts. They have recommended that cuts be at least .001-inch per broach tooth. Any cuts below this cause the teeth or cutters to ride over the workpiece, producing a burnished effect, or work-hardening.

Naturally, heavy cuts on this tough alloy are highly heat generating, and a light coolant which penetrates to cutting depths is required to cool cutting edges and flush chips. There is doubtless a value in its lubricating the surface because of the work-hardening factor mentioned above. Most non-corrosives tend to work harden but it is probably unusually noticeable, comparatively, in this alloy.

Form milling serrations

Further operations, from 4 through 13, include broaching and grinding tapers. While these operations are highly important, they need not be described here to convey the outstanding features of machining. In grinding, half a dozen pieces are secur-

ed to the grinder table in a special jig and are ground simultaneously.

Serrations which key the butt end of the blade to the turbine spindle are form milled, both sides of the end being milled simultaneously as they are fed on a horizontal radius between opposed cutters revolving counter to each other. The depth of cut in this operation is .145-inch. Considering that serrations are designed for .0005 clearance, a heavy fixture and work-holding device are necessary to hold such a heavy cut into this alloy to required limits.

Top-grade cutters are an absolute requisite. Because hardness is variable, particularly today, ranging from 190 to 220 Brinell, tools must be able to stand the maximum shock.

Special jigs

Bevels are straddle milled on one surface, preparatory to form milling the convex surfaces. For this sequence of operations which produce the convex surfaces, special problems were presented in designing a jig which would hold the blades securely and allow cutter clearance. A cartridge was designed with a slot conforming to the side contours of the workpiece, and with slots for the locating lugs at each end, assuring exact location in the cartridge. For several milling operations, the workpiece remains in this cartridge, and the whole jig is located on the milling machine table.

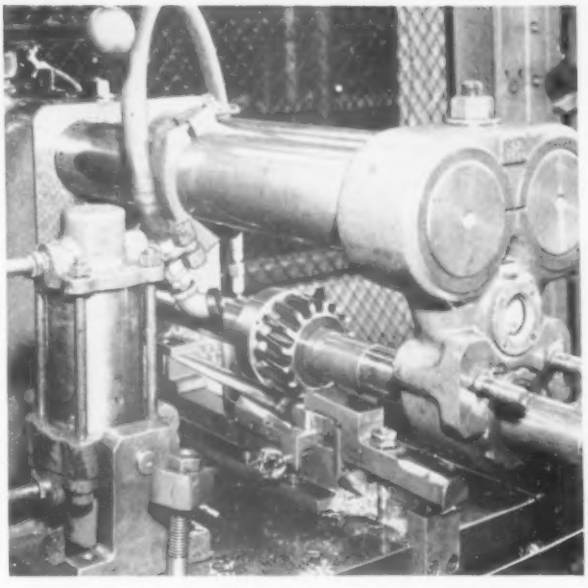
Surface cutting speeds on milling cutters cannot exceed 30 feet per minute because of the toughness of the metal.

Compensating operations

In milling the convex and concave surfaces, in which the centerlines are not parallel, limits are difficult to hold because of the tendency of the metal to spring and warp. Small failure to hold limits, though not a usual result, can be compensated for in the following operations where the depth of cut is sufficient to overcome slight inaccuracies.

Because of clearance difficulties caused by design, the convex surface cannot be completely milled by a convex cutter. At the butt end of the blade, the curved surface is finished up to the desired point by a plain mill. Though the result is a cut on a radius, neither workpiece nor cutter actually moves through an arc.

Because of clearance difficulties caused by design, convex surface cannot be completely milled by a form cutter. At the butt end of the blade, surface is finished by a plain mill. For this radius cut, neither work-piece or cutter moves in an arc.



Hydraulic force (note cylinder in foreground) holds jig table against cam adjacent to cutter. Workpiece rides up and down against this cam, or roller, as table passes beneath the milling cutter.

A jig has been devised to hold the workpiece against the cutter, raising and lowering it as the table moves horizontally beneath the milling head. The finished section of the convex surface serves as a cam over which a roller adjacent to the cutter rides. As the workpiece moves under the milling head, the slanting table of the special jig, motivated by pressure from an air cylinder, holds the workpiece firmly against the roller and cutter, automatically attaining the cutting depth.

Final buffing operations remove as much as .003-inch. They build the high finish which is one of the notable characteristics of non-corrosive steel. In machining the particular alloy used for turbine blades, the tendency for the work to spring from the cutter or warp slightly produces a rough, almost corrugated finish which buffing removes.

A simple series of sight gages has been designed to check dimensions, both during production and on the finished product. The blade is fitted into gaging jigs. Centers as well as surface contour are checked by gages at each end of the jig.

THE END

A simple series of sight gages is used to check dimensions after non-corrosive steel has been buffed to a high finish.

Sharpening a spiral end mill on a Cincinnati No. 2 Cutter and Tool Grinder. Note that the proper position of the tooth rest, as indicated here, is at right angles to the cutter tooth.

Use of the Tooth Rest in Cutter Sharpening

H. M. HUFFMAN
CUTTER GRINDER SPECIALIST
THE CINCINNATI MILLING MACHINE COMPANY

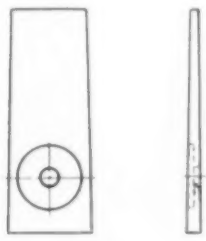
TO the cutter grinder operator whose experience is limited, one of the most perplexing elements of his job is the tooth rest.

Obviously, different types of sharpening jobs require different tooth rests, but when to use the square, radius or offset blade is not always evident.

If the correct tooth rest is not used, the cutter will not be sharpened correctly, resulting in unsatisfactory or spoiled work, coupled with all the lost time and factors of expense incident to resharpening the cutter (and sometimes replacing it), and manufacturing new parts.

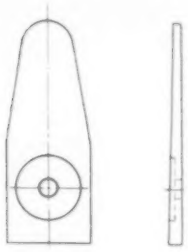
There are five general types of tooth rests, with dozens of variations for each type. When their purpose is understood, they can readily be fabricated for a specific job.

"Standard" tooth rests are supplied with cutter sharpening machines, and are suitable for a wide range of cutters. Numbers 1, 2 and 4 are supplied with Cincinnati No. 2 Cutter and Tool Grinders. Numbers 3 and 5, and any other special shape, can readily be made in the average shop. THE END



NO. 1

Straight blade. Used with adjustable holder for grinding straight fluted reamers, side mills, end mills or any type of straight fluted cutter. This blade is also used for sharpening the face and corners of face mills.

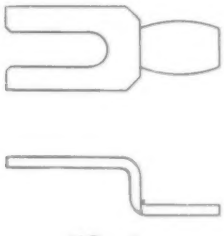


NO. 2 PC-1057

Tooth rest blade with a radius end. Used for sharpening spiral milling cutters and stagger tooth cutters of various types.

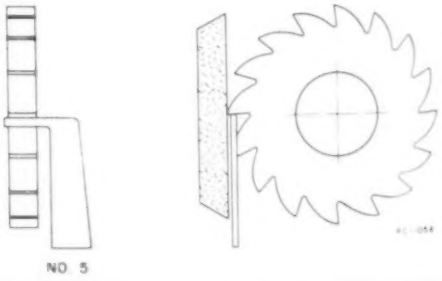
NO. 3

Tooth rest blades of various radii, from 1/16-inch for fine-pitch cutters up to ½-inch radius for large diameter cutters with widely spaced teeth. Note the contact points of spirals of various angles, indicated by arrows. These contact points should be set at rim of wheel.



NO. 4

Offset tooth rest blade. Used for sharpening large diameter, coarse-pitch spiral milling cutters and the peripheral edges of large face mills that have angular blade inserts.



NO. 5

L-shape tooth rest blade for sharpening metal slitting saws and straight tooth plain milling cutters.

A simple method for

Estimating Tooling Costs

H. E. PEIFFER
CHIEF ESTIMATING ENGINEER
SAVAGE ARMS CORPORATION

SAVAGE ARMS CORPORATION · TOOL PRICE ESTIMATE

Sample master estimate form. Costs of additional operations, classified as "extra steps," are added to the basic form cost.

SIZE of tooling problems in ordnance and other war plants, makes standard methods of handling, estimating and purchasing essential to smooth operation.

After two years investigating a large number of tool rooms and a careful study of costs and prices of hundreds of tool vendors, it has been possible to set up a standard system of average job shop cost-estimating for tooling. It is known as the "basic plus extra step method." Before examining the simple details of the system itself, let's consider its benefits, and some of the basic requirements of cost-estimating.

This method has been used, successfully, in certifying for approval to the government auditors an immense number of tooling charges on a large ordnance contract. It has proved satisfactory as to fairness and reasonableness of price under the conditions and circumstances existing at the time of manufacture.

Equally important this estimating system is used to train new employees quickly in the rudiments of simple tool cost-estimating, to release experienced employees for more technical work, and to arrive at a reasonably accurate average job shop cost in a minimum of time—important where experienced estimators are scarce. It furnishes standards for operations and time used in preparing a tool cost so that consistent prices may be obtained, and it fixes a fair and reasonable price in advance of purchases, eliminating the disadvantages of bid buying.

A combination of standard average methods, operation sequences, feeds and speeds, costs and prices, and years of actual shop experience in all types of shops are used in arriving at average cost figures.

Much helpful information was also secured from machinists' handbooks, manufacturers' catalogs and specification sheets.

This system should not be confused with elaborate systems of detailed estimating used for figuring production costs in production plants, but is intended to be as accurate as reasonably possible under average job shop conditions and circumstances.

●

BECAUSE there are many types of tool manufacturing shops it is necessary to classify the shop which will do a job, where such information as the following is available:

1. **Size of shop** (small, medium or large).
2. **Type of shop** (job or production).
3. **Type of equipment** (good, average or poor).
4. **Type of personnel** (skilled or apprentice).
5. **Supervision** (intelligent or otherwise).
6. **Conditions and circumstances of manufacture** (normal or abnormal).

Classification is useful in tempering the master *average* estimate to meet individual shop conditions. Accuracy developed in classifying the individual shop will determine the final accuracy of the tool estimate.

An estimate used to substantiate a price should be detailed at least to the point where it is apparent that the figures were not arrived at by guesswork. Expert estimators may vary widely in making quick lump sum estimates for the same item. This may be caused by each estimator using a different type of shop as a basis for his estimate.

The average job shop estimate has been found to be closer to an ideal basic estimate than a so-called high or low ceiling price estimate because of the difficulty encountered in trying to determine how fast or slow a man or machine may work.

●

FEW TOOL MEN can estimate accurately, in detail all of the following four classes of tools:

1. Simple flat tools.
2. Simple jigs and fixtures.
3. Standard cutting tools.
4. Special tools (all classes).

The "basic plus extra step" method is used in rapidly educating new employes to cover a wide field of estimating shop tool costs accurately

The last class, requiring considerable manufacturing experience and training to estimate with reasonable accuracy, should be left to the tool man who is able to temper his estimate with experience. But any reasonably intelligent employee may be trained in a few months to estimate the first three classes above with the "base plus extra step" method. This has been found to be the best and simplest way of teaching the rudiments of tool-cost estimating; this principle is used by the cutting-tool industry in pricing cutters and by the steel industry in pricing steel.

How to find average base cost

Average base cost of the tool is found by taking the average operations and time for making up the basic form only of each detail plus the actual cost of the material used, as shown by the sample master estimate form. All additional operations are added to the basic form cost in the form of complete extra steps, including time to cover each operation necessary to produce an angle, radius or flat on the tool. In that all operations are based on the production of these three forms, singly or in combination, they are for the purpose of simplification arbitrarily divided into three classes which are called, "Machined, Ground or Lapped" extra steps.

Usually, those extra steps include the following operations:

Machined steps — milling, drilling, tapping, turning, sawing.

Ground steps — form, surface or other finish grinding.

Lapped steps — lapped, honed or stoned surfaces.

Extra steps must also be limited as to size, diameter, length area, and tolerance.

It is only necessary to make up a few basic form master average estimates and set the average time for the various classes and sizes of extra steps to cover a wide field of tool estimating. Little effort or experience is then required of the estimator.

THE END

Mack Adapts Standardized Equipment to

Precision Gear Production

Through production control and correlation of equipment, this well known truck manufacturer mass produces with high accuracy specialized precision gears.

CHARLES H. CRAWFORD
PRODUCTION ENGINEER
MACK MANUFACTURING COMPANY

WIDELY REGARDED as a "pilot" plant in mass producing specialized precision gears for military combat vehicles — particularly tanks — the gear department of the Mack Manufacturing Company has adapted well known automotive mass-production equipment to its problems.

Though required accuracies exceed normal demands — as in trucks or automobiles — production control and correlation of equipment, rather than new production processes, have achieved desired results. Not only

Figure 1. This battery of Michigan rotary gear finishers is used for finishing virtually all tank gears produced by Mack.

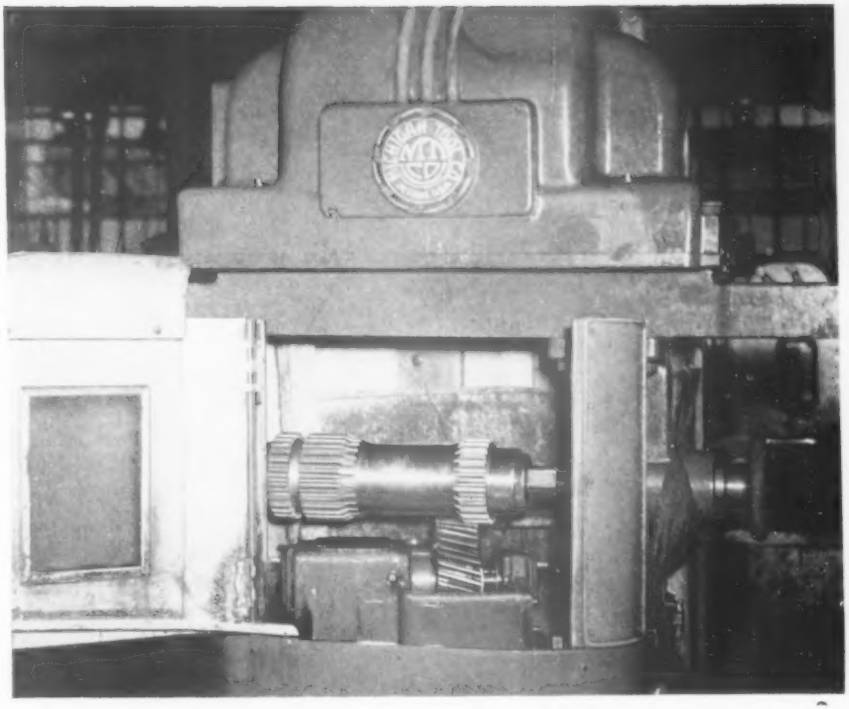


Figure 2. Close-up of a Michigan rotary gear finisher with extension head, being used for high precision finishing a spline on a heavy duty transmission shaft by crossed-axis shaving.

was there a minimum of delay in attaining large scale production but also exceptionally consistent product operation.

The general process in producing gears at Mack Manufacturing starts with rough forming the blanks — using largely carbide cutting tools on Bullard Mult-Au-Matic.

Internal splines are produced by broaching. For this purpose two types of Colonial machines are used. For smaller gears a Universal horizontal machine is used, while for the larger ones a Pull-down type is employed. The advantage in the latter case is that the extremely long and heavy broach required for the larger gears is less likely to sag on vertical machines.

Hobbing

Wherever possible, gears are hobbed. This is done in two steps — rough and finish hobbing, leaving about 0.035 to 0.040-inch for finish hobbing and about 0.001-inch after finish hobbing for shaving.

Contrary to usual practice of using class "B" hobs for finishing prior to shaving, Mack employs Class "A" hobs. The reason is that accurate top hobbing is required for ease of chucking when grinding the gear bore.

Some types of gears not lending themselves readily to hobbing are finished by shaper cutting. This includes, particularly, herringbone types — although some others are produced on shapers. Wherever possible, shaper cut gears are subsequently finished by crossed-axis shaving.

Finishing of gears is carried out on a battery of Michigan 860 type rotary gear finishers, some of these being equipped with special extension heads for shaving of gears on relatively long shafts. In general, gears are held to 0.0002-inch as they come off the finishing machines and before heat-treating.

The crossed-axis angle selected for shaving gears is determined to some tent by the character of the stee Gears are actually shaved off true lead angle to compensate in advance for subsequent heat-treat distortion.

Cutter design on the shaving machines is such as to not only finish the tooth form accurately and give the desired lead angle, but also to hold "tool marks" in line with the plane of rotation for maximum gear life.

After heat-treatment, gears are quenched in Gleasons and sample lots from each heat are checked on "Sine-Line" machines for lead angles as a check on distortion characteristics.

Included in the gear checking equipment provided is a Michigan "Sine-Line" involute checker, but it

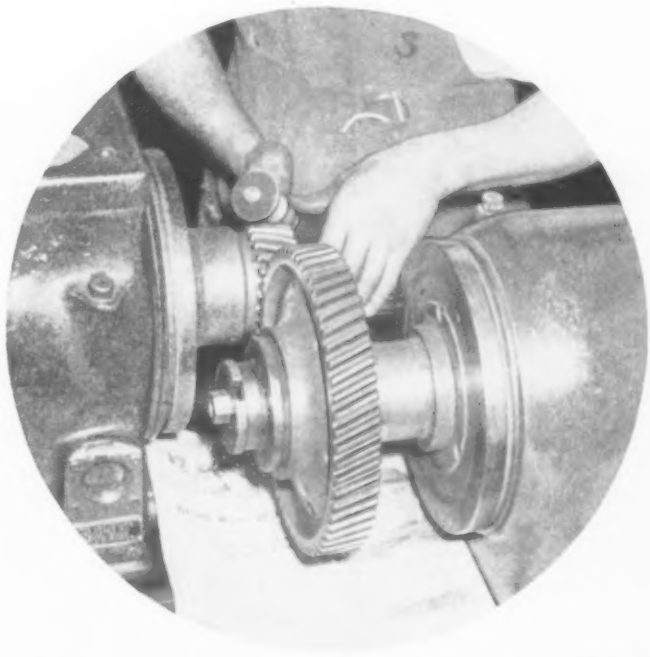


Figure 3. Removing burrs caused by handling, following heat-treat on a gear matching machine. Gears are run in both directions on this machine to check contact area.

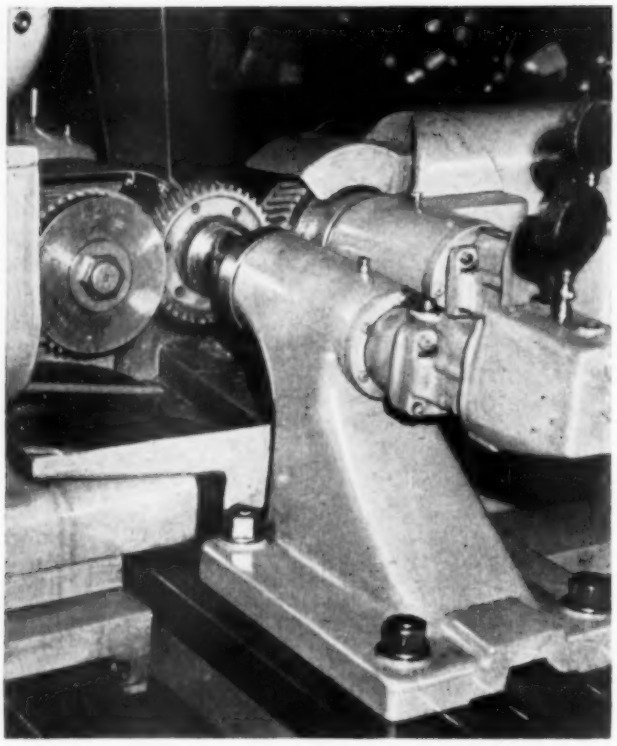


Figure 4. Lapping a tank gear on a Michigan Duplex lapper. A slight carefully controlled amount of crown is produced to protect gear contact against the effect of possible minute assembly variations.

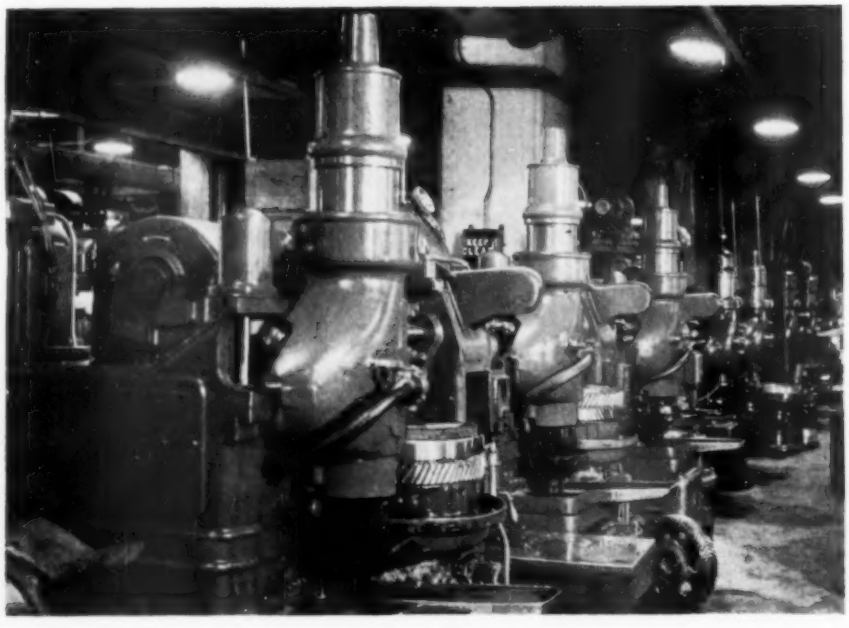
Figure 5. Gears are 100 per cent checked using the pin method to insure accurate dimensions.

is used mainly when trouble develops and it is necessary to locate the source of the difficulty. Thus the lead-checker is used as a production control instrument, while the function of the involute checker is largely a laboratory one. Approximately five per cent of all gears are machine checked in production.

After heat-treating, gears are matched in pairs and run for a few seconds on a Gleason lapping machine mainly to check the relationship of matched pairs. Thus these lappers are used in effect as production checking machines. While on these machines, high spots of interference — as may be caused by damage in handling — are readily identified and corrected. Most of the touch-ups of this nature are naturally on the corners of the teeth and consist of such operations as removing minor burrs.

From here the gears go to Michigan Duplex type lappers. These machines produce a small amount of crowning — just enough to insure a good bearing even though there may be minor variations in assembly alignment.

Figure 6. Herringbone gears are finished on batteries of gear shapers. Where possible, shaped gears are finished by shaving, for maximum accuracy.



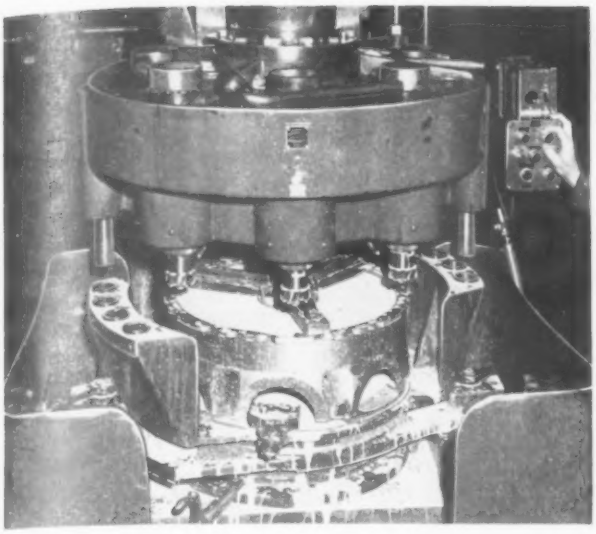
Inspection is thorough

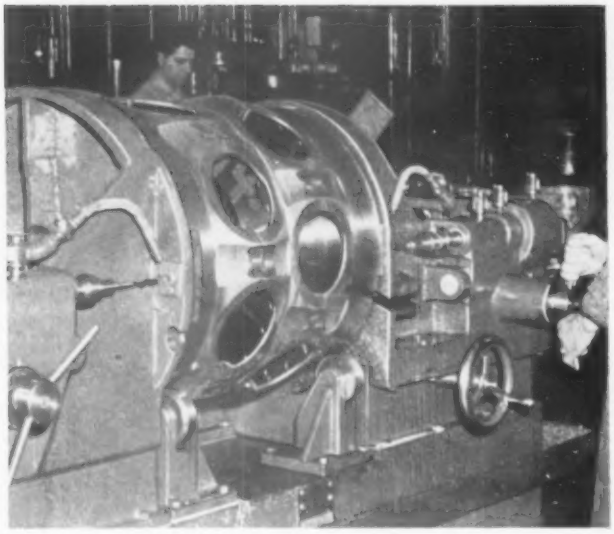
The entire set-up is extremely flexible in character and is so designed that lots of gears of different kinds can follow each other through. Each time the set-up is changed, the first gear is accurately checked.

Pilot machines of the entire line are the lappers. Here a close watch is kept for tooth contact and any deviation is traced to its source.

Before assembly all gears are pin-checked. There is a 100 percent check of gear pairs for correct center distance and other dimensions.

THE END





Wright Aeronautical Photos

This seven spindle, four station, automatic indexing Barnes Drill machine cuts 28 scallops around the flange of a Wright Cyclone 14 crankcase.

Designed by Wright Aeronautical Corporation tool engineers, this four-spindle machine rough and finish re-reams locating dowel holes in both ends of a Cyclone crankcase.

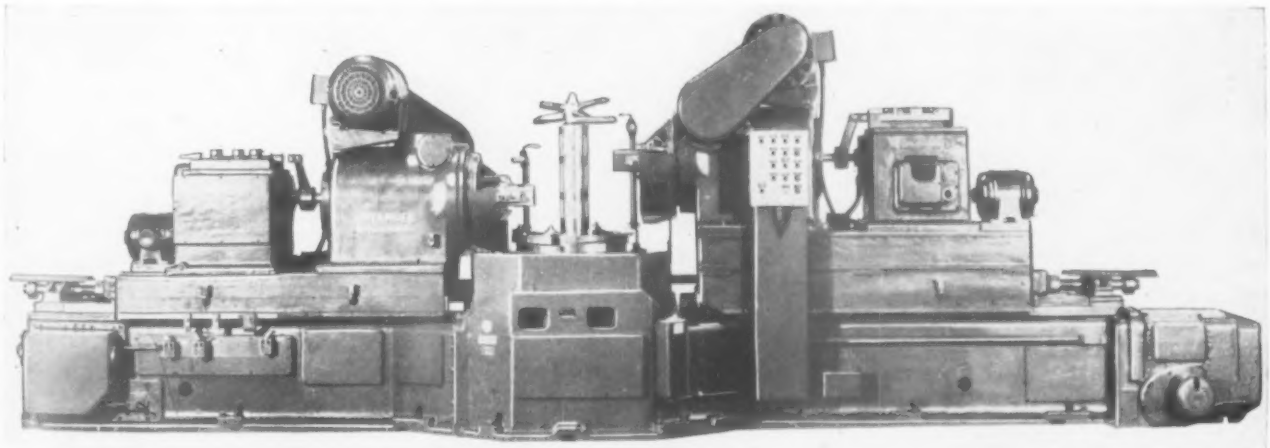
TOOL ENGINEERING in the Aircraft Engine Industry

H. E. LINSLEY
WRIGHT AERONAUTICAL CORPORATION

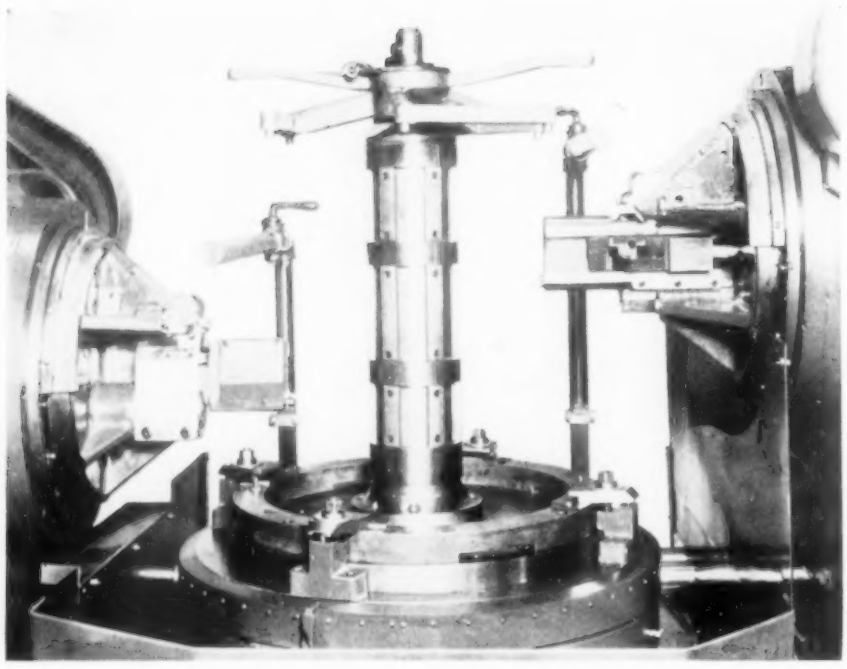
THE Wright Aeronautical Corporation was the first aircraft engine manufacturer to apply mass production methods to the exacting requirements of so highly complex a mechanism as an aircraft engine. That this company has been able to produce parts by the hundreds of thousands while at the same time maintaining the most rigid standards of precision and finish represents a real triumph for tool engineering.

The manufacture of the Cyclone crankcase furnishes several examples of unusual machines designed to replace conventional equipment, and so constructed that the essential skill has been built into the machines themselves to permit operation by only semi-skilled workers. This important and highly stressed part is made up of three steel forgings rough machined

Special machines replace conventional equipment as Wright Aeronautical speeds output of Cyclone engines —saving as much as 50 per cent machine time.



Boring, facing, and chamfering of the crankcase deck pads are performed on this special double head machine which handles both rows simultaneously.



A close up view of the operating portion of the machine shown in Figure 2. Note arrangement of tools in the right hand head and clamping arrangements.

separately up to a certain point, and then assembled for the final operations to assure alignment and concentricity. On the rear section is a flange for attaching the supercharger housing, and in order to save weight 28 scallops are cut out of this flange on a special 7-spindle Barnes Drill Hydram machine. (Figure 1).

The part is located on dowels fitting into previously drilled and reamed holes, and is locked in place by a three-arm spider clamp which bears on the upper edge of the flange. Any tendency to rotate is resisted by thrust pins which bear against the edge of the semi-circular openings at the bottom of the part. The ends of these pins are brought into contact with the part by means of hand knobs, and are secured by locking knobs.

A four position automatic indexing table is employed, positive location being assured by two large diameter dowels engaging in bushings in the brackets which form an integral part of the fixture. The seven high speed steel cutters feed straight down, as in drilling, feed being hydraulic.

Ordinarily, sheet steel splash guards extend around the outside of the cutters, but these have been removed in the picture to show the details more clearly. This is a roughing operation, the final cut being taken on a special Sundstrand profile mill which removes the remaining stock and forms a small radius to blend the scallops with the outside edge of the part. This one machine has a productive capacity equal to that of three of the radial drills originally used for this operation, costs appreciably less than one radial, and occupies less than one third of the floor space.

After assembly of the three, rough machined sections of the crankcase, it is necessary to re-ream the locating dowel holes in each end to eliminate any errors caused by distortion due to the heavy stock removal. At one time this operation was performed on a radial drill, reaming both holes in one end, and then turning the part over for reaming the remaining two. Wright tool engineers, however, designed the special machine shown in figure 2, which was built by Frederick Coleman.

The machining time is reduced to slightly more than half of that formerly required, but of greater importance is the fact that there is a substantial increase in accuracy. The part is located on plugs which fit closely into the main bearing holes, and is positioned by inserting a hardened plug through one of the bushings into an original dowel hole. Both holes in one end are then rough and finish re-reamed, using end cutting reamers, after which a plug is inserted through a bushing into one of the finished holes the plug in the opposite end is removed, and both the remaining holes are simultaneously re-reamed. Magic chucks speed up the change from roughing to finishing reamers.

The hand wheel visible at the right hand end of the machine controls the in and out movement of the right hand head to permit loading and unloading of the part while the rollers at the front of the machine support the part during this operation.

This special six-way Greenlee machine automatically drills and back counterbores 280 holes for the cylinder hold down screws in the Cyclone crankcase.

A close up view of the machine shown in Figure 5. The massive construction assures absolute rigidity. Note distribution of the coolant to each tool.

Equally spaced around the periphery of the Cyclone crankcase are fourteen flat surfaces known as "deck pads." These are arranged in two staggered rows of seven each and are designed to receive the flanges of the cylinders. It is essential that these pads be dead flat and evenly spaced, and that the center distance between the two banks be held to a total tolerance of 0.0005 inch.

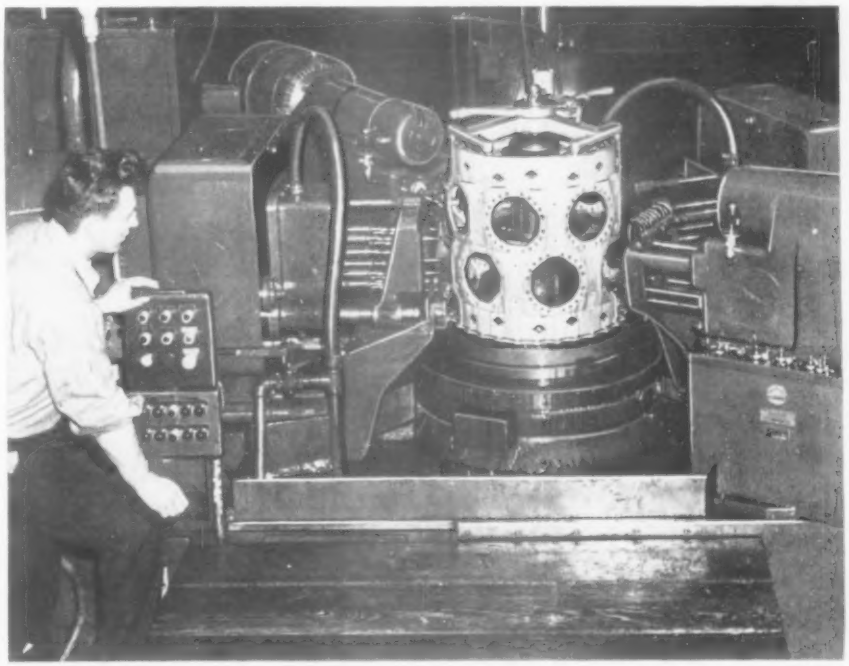
The boring, facing, and chamfering operation is performed on a specially designed Greenlee machine equipped with an automatic, seven station index, (Figure 3). The right hand head operates on the upper row of pads, while the left hand head machines the lower row. Two of these machines are employed; the first for rough machining, the second for finishing. Parts are located by means of hardened dowel pins, and are clamped by a three arm spider bearing on the upper end. This clamp incorporates a spring loaded wrench which permits the application of sufficient pressure to hold the part, but not sufficient to crush or deflect it. Additional clamping is by means of four small clamps which bear on the flange, (Figure 4). The center post is for approximate locating and is equipped with fibre rubbing strips to avoid injury to the finished bearing bore. Hydraulic feed is employed, and all three tools for each head are incorporated into a single unit. After the boring tool has passed through the opening the forward feed stops, and the facing tool feeds out radially, while at the same time the chamfering tool feeds downwards on an angular slide to produce the desired chamfer.

The indexing mechanism is entirely automatic, and is interconnected with the feed so that both heads must be fully withdrawn before the part can index to the next position. At the completion of a full cycle, the machine stops automatically for reloading. Prior to the adoption of this type of automatic equipment, the rough facing of the pads was performed on a duplex mill, four of which would be required to produce as many parts in 24 hours as the Greenlee produces in 18 hours.

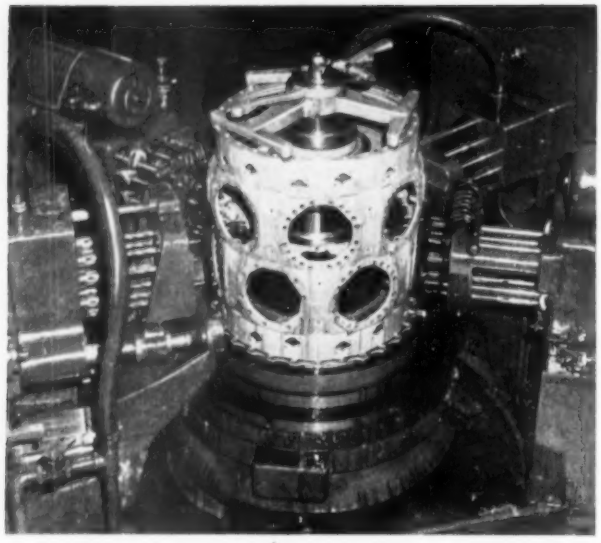
The finishing operations of boring, facing, and chamfering were performed on automatic turret lathes of which six would be needed to produce in 24 hours as many as can be made in 12 hours on the Greenlee.

For holding the cylinders down on the deck pads, twenty cap screws are used in each, a total of 280 holes to be drilled, reamed, back counterbored, chamfered, and tapped. Single spindle equipment was originally used for all of these operations, although later, multi-spindle drills and special twenty spindle back counterboring machines were employed; tapping, however, was always a single spindle job. To keep pace with the other mass production equipment, special Greenlee machines are now employed, one for the drilling and back counterboring, the other for the reaming, countersinking, and tapping.

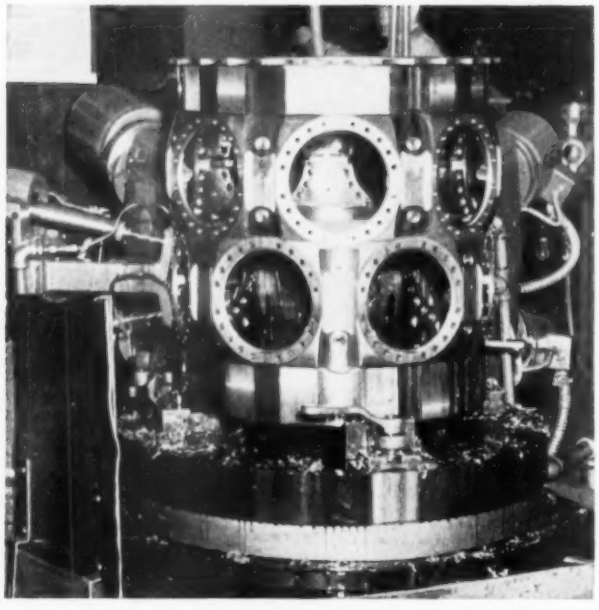
The first of these has reduced machining time to one-fifth of that re-



The holes drilled on the machine shown in Figure 6 are combination reamed and countersunk by two of the ten spindle heads and tapped by the remaining two heads of this Greenlee machine built specially for Wright.



In this close up may be seen the arrangement of the individual coolant pipes for each tap. Notice the well supported jig plates for grinding the reamers.



Drilling, spotfacing and back countersinking 14 pairs of angular holes in the sides of a Cyclone crankcase are operations performed on this special Rehnberg - Jacobson machine.

Reaming, countersinking and tapping are performed on this Rehnberg - Jacobson drill as one of the final operations on this Cyclone crankcase. Note the masking tape used to protect the finished surfaces of the deck pads.

quired for the former multi-spindle equipment, while the second has cut the time for its operations to one-fourteenth of that formerly needed. On both machines the first row of seven pads is machined, and then the part is inverted for machining the second row. Location is by dowel pins and hardened blocks. When the rear end is uppermost, the blocks engage the outside diameter of the part, but when the front end is up the same blocks engage the inside diameter.

Figure 5 shows the six-way machine for drilling and back counterboring. The first unit drills ten holes, while the second and third units each back-counterbore five; unit number four drills the remaining ten holes, and numbers five and six in turn back-counterbore these. This staggering of the operations is necessitated by the close centers of the holes. Feed is hydraulic, and the feed and indexing mechanism are interconnected to prevent indexing until all tools have been fully withdrawn.

In the event of any unit failing to complete its full cycle — advance, feed, withdraw — the part will not index; similiarly, if the part were to be indexed manually so as to place it out of cycle the units would not operate until the proper cycling order were restored.

Back-counterboring operation

Figure 6 is a close up view of the same machine and gives a good impression of the ruggedness of the construction. It will be noticed that well supported jig plates are used on the drill units, the massive spindles and the small amount of overhang assure freedom from chatter. The operation of the back-counterboring cutters is worthy of mention. In their normal position they are located off-center a sufficient distance to permit them to pass through the holes. As soon as they have passed through they automatically move to the on-center position, and then feed backwards until the counterbores are to the required depth, whereupon they return to the off-center position and pass out through the holes.

The machine for combination reaming and countersinking, and tapping is shown in figure 7, and is similar in most respects to that used for drilling, except that it is only a four way machine. The reamer feed is hydraulic, but individual lead screws are em-

ployed for the taps to assure precision. The close-up view of this machine, figure 8, shows each tap with its individual oil supply pipe. These are so arranged that a jet of coolant under considerable pressure is directed into each hole to clean out any chips before the tap enters; this liberal supply also keeps the hole clear during tapping, and prevents damaged threads.

Between each pair of deck pads are two holes which are used as locating points for various clips and brackets. These 28 holes must be drilled, backcountersunk, spotfaced, reamed, countersunk, and tapped. This was formerly done on standard radial drills, using an indexing fixture so designed that it could be rocked through a certain angle to accommodate both holes of each pair. At best, it was a slow operation, and the two machines shown in Figures 9 and 10 were therefore designed to speed the production. They have displaced nine radial drills, and perform the job in one-sixth of the former time. The first machine drills, spotfaces, and back countersinks two holes at a time, indexing automatically; the second machine combination reams and countersinks, and taps.

When the holes in one row have been machined, the part is turned over and the holes in the second row are similarly machined. Certain operations, including cadmium plating, intervene between the drilling and the tapping operations, as is evident in a comparison of the appearance of the part in Figures 9 and 10. In order to prevent scratching of the finished surfaces by chips from the reamers and taps, masking tape is applied to the surface of the deck pads before this operation.

After all final machining operations have been completed, the crankcase is disassembled, and each of the three sections is inspected 100 percent. This includes magnetic inspection, using the equipment shown in Figure 11. A heavy brass bar is passed through the main bearing hole and serves both as a lifting bar and as a conductor. As the part is lowered into the tank containing naphtha and finely divided iron oxide, the ends of the bar are guided by channels and bear against copper conductor bars through which the magnetizing current passes to the part. When the part is removed from the tank any discontinuities or flaws in the metal will be defined by a black line of iron particles. At the right side of the tank may be seen the demagnetizing equipment consisting of a box with slotted sides to receive the lifting bar, and a de-magnetizing unit. The part is loaded into the box and is then pushed along the conveyor which passes through the unit. At the far end it is removed, completely demagnetized.

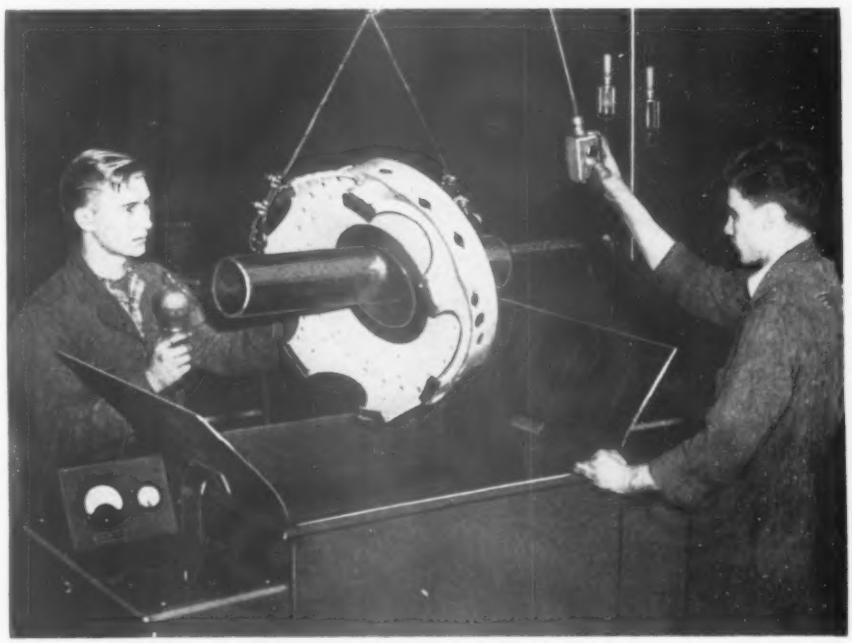
The foregoing does not, of course, cover every phase of manufacture of this part, but it will serve to give some idea of the way in which tool engineers have tackled the tremendous problem of combining extreme accuracy with unprecedented volume production. The value of the airplane in this present conflict is beyond all question, and it is acknowledged that an airplane is no better than its engine. Ultimate victory depends in no small measure upon overwhelming air supremacy. For this, aircraft must be produced by the hundred thousands.

THE END

IF this be a war of machines, then it follows that it must also be a war of engineers, and particularly of mass production engineers. The stepping up of production to its present high level could have been achieved in normal times, had there been a need for it, by the simple expedient of employing thousands of skilled workers to operate thousands of standard machine tools, provided, of course, that no element of time were involved. In the war emergency, however, time has become a most vital factor, and coupled with it has been the desperate shortage of man power and machine tools. Mass production therefore, offers the logical method to obtain maximum output in minimum time and with minimum manpower.

Until this war, such methods had never been tried in the aircraft industry, not because of any lack of understanding of their advantages, or ignorance of their application, but because production schedules had been so small that there was no justification for the employment of special purpose, high production equipment.

Consequently, when the demand came no suitable machines were available, and it was here that tool designers stepped into the picture. Some of the machines that resulted from the months of intensive application on the part of these production specialists were similar in many respects to others already in use in other industries, but for the most part they were entirely different and surpassed in productive capacity anything ever before seen.

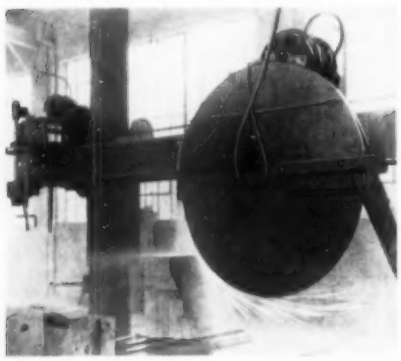


For the magnetic inspection of the finished section of a Wright Cyclone crankcase a specially designed tack is used, together with a brass carrier bar held by a quick-detachable sling.

Slow, crude, stone-cutting equipment has been successfully converted to rapid machining of machine tool and Liberty ship engine castings

Tombstones to Gear Shapers

A NOTABLE production front story concerns the Vermont Marble Company's conversion to war manufacturing of the slow, light and inaccurate machines which shaped the columns for the Supreme Court Building in Washington. Today, that equipment, completely rebuilt, is machining parts for many eastern machine tool builders, is building complete spline millers, hydraulic planer-shapers, landing barge winches and is to begin production of gear shapers.



Diamond saw, common to the industry, shown making a rapid cut through a piece of marble.

In the spring of 1940, its president, Redfield Proctor, foresaw the possibility of war and took steps to convert his shops and organization to readiness for war production. The nucleus was a battery of large stone planers. Compared to metal planers, they were crude, and of their speed a machine tool builder remarked that they went down one shift and came back the next.

Each marble machine was torn apart and thoroughly rebuilt. The result was increased speed and accuracy of finish.

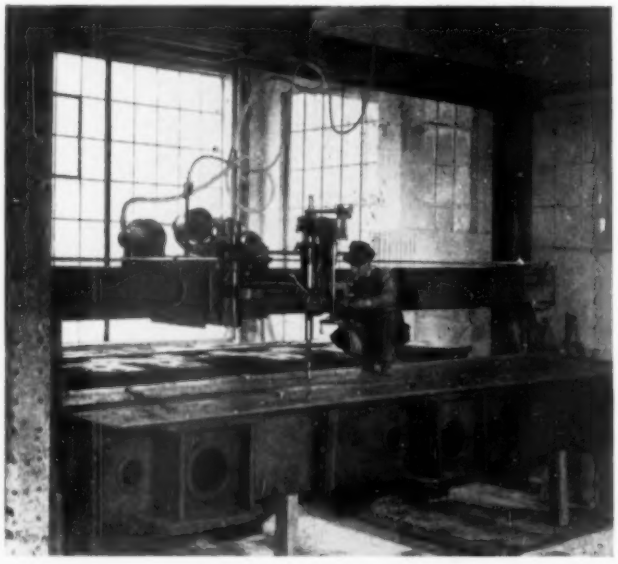
After most of the stone working machines were converted, many used machine planers and other tools for metal working were purchased and rebuilt. All are operating 24-hours a day.

In addition to converting machines, it was necessary to train operators. The men, mostly of a high type with inherent skill, have taken to their new jobs with enthusiasm.

For drilling small holes through thin stock, a polishing machine was converted to operate as a radial drill. Column castings for Liberty ship engines are planed and drilled. Machining the ends of these columns which measure 13 feet, one-inch to .003 tolerance, plus or minus, involved a problem inasmuch as no planer wider than 12 feet was available. The problem was solved by putting right and left hand open side planers 14 feet, four inches apart and connecting the posts and tables. Planing was done on each end simultaneously by using side heads. Each planer had an individual belt drive which synchronized itself by slight belt slippage.

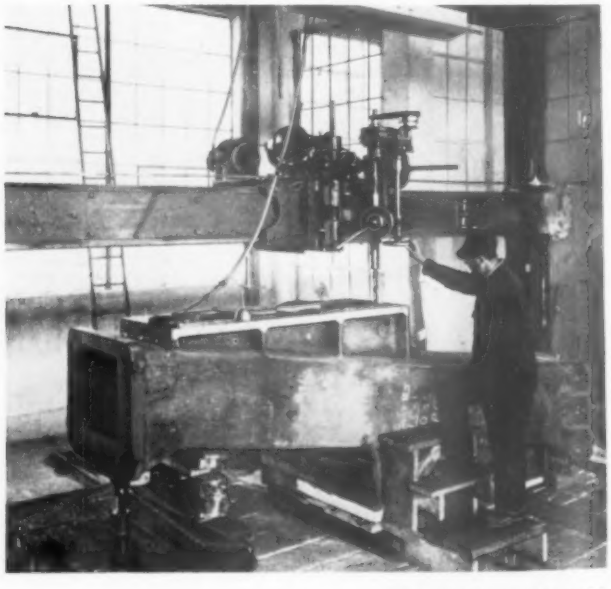
THE END

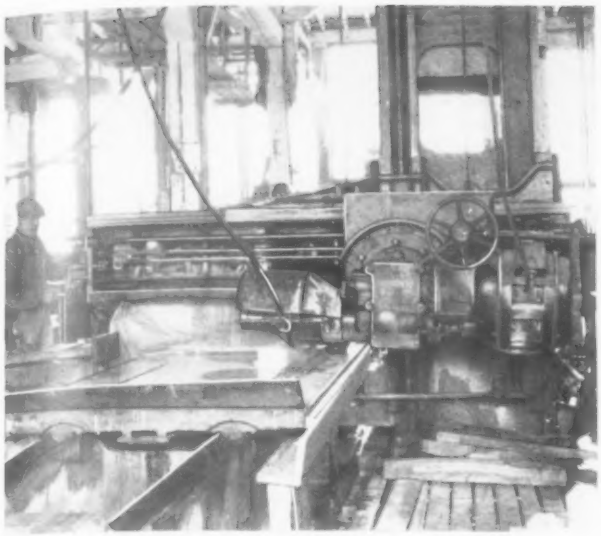
Vermont Marble Company Photos



Diamond saw was converted to traveling radial drill. It drills 90 anchor bolt holes in the bottom of 12 by 20 foot bed of a Liberty ship engine. Marble cutting blade and drive were removed, and replaced by the arm of an obsolete radial drill and toggled up drive. Bed moves in on two cars and drill travels along rail, covering an area of 14 by 20 feet.

***Below:* Diamond saw frame converted to radial drill shown drilling column for Liberty ship engine.**

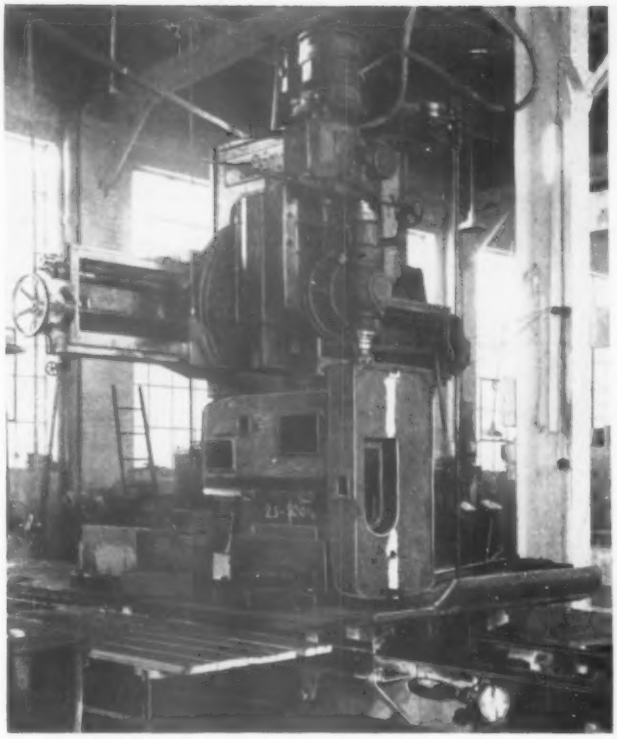


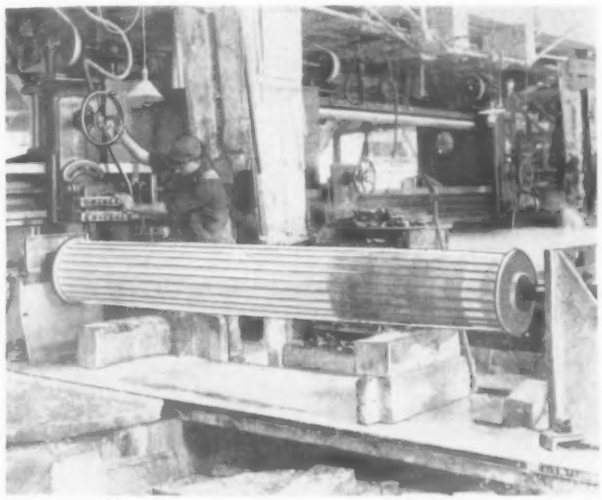


Typical marble grinding machine used in finishing operation is shown beveling a small piece of stone.

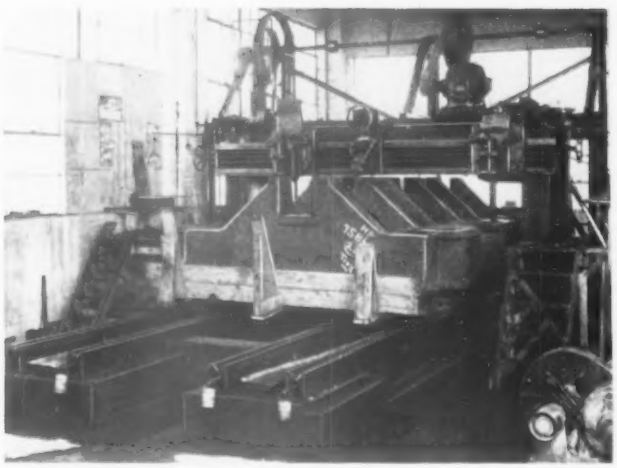
●

Right: Marble grinding machine was equipped with universal milling head. It is shown machining the column for a milling machine. Carbide tipped cutters are used. Hydraulic controls maintain feed.





Marble planer fluting a column.



Marble planer rebuilt, equipped with three heads, is shown machining beds for engines on Liberty cargo ships.

U. S. ORDNANCE IS SUPERIOR

● "America's colossal war production effort," says Army Chief of Ordnance Maj. General Levin H. Campbell, Jr., "is turning out the finest fighting tools ever placed in the hands of fighting men."

"We invented the machine gun; and then we perfected the machine gun. Our machine guns fire at a higher cyclic rate than those of our enemies. They will outfunction any enemy gun under the most adverse service conditions. They will keep firing when enemy guns have to shut down to change barrels.

"I know what I'm talking about. We have all the enemy's machine weapons and we've made comparisons. The enemy cannot outdo American design and American production.

"Type for type, our tanks have heavier armament, and greater speed. I'm not talking through my hat. I know. We've captured enemy tanks, and we have conducted every conceivable engineering test upon them. The best proof is the proof of battle. Our tanks have more than met the trials of combat.

● "We know by actual test what our high-velocity 75-mm. shell can do to German medium tanks. We blast big holes in them at ranges beyond which their guns can reach. And we can fire this high-velocity 75-mm. gun when the M-3 tank is in motion, which is more than any enemy tank can do.

"We have read of the 'new German 88-mm. gun.' This weapon is about as secret as a Daisy water pistol.

"We too, have double-purpose weapons. We're not saying what they are, but I can say they are heavier in fire-power, they possess higher muzzle velocity and carry greater explosive charges than the German 88-mm. gun.

"For anyone to assume the United States is asleep in the field of armament, is to assume Detroit has been asleep in the automotive field in the past two decades.

"Guns are machines. Nobody in the world makes better machines than are made in the United States. You wouldn't believe Germany or Japan could make better automobiles. Don't believe they can make better guns. They can't."

SPEEDS AND FEEDS for various materials, and for various cutting steels and alloys, have been generally standardized during the past several decades. However, these standards have been considerably modified by late developments, in many instances cancelled out entirely by the unprecedented speeds made possible with modern machine tools. Hence, they can only serve as norms for conventional processing, or as bases for comparison of radical methods. Yet, how compare previous speeds of a few hundred to a thousand feet per minute for aluminum with modern speeds of 10,000 feet or more? Or the cutting speeds of carbon or even high speed steels with modern carbides?

However, this writing will not be concerned so much with speeds and feeds as with practical applications — the ways of doing. We'll deal with the problems of the moment, though these may be but old ills in new guises. In this connection, much of the material is based on questions which have been directed to the writer, and which have been individually answered. And, while the problems may seem elementary as presented in simple form, they have been sincerely posed by experienced tool engineers who, because of plant conversion, have been forced into new fields.

Metal Cutting

A. E. RYLANDER
MASTER MECHANIC
MIDLAND STEEL PRODUCTS COMPANY

This is the third article in a series about metal cutting.

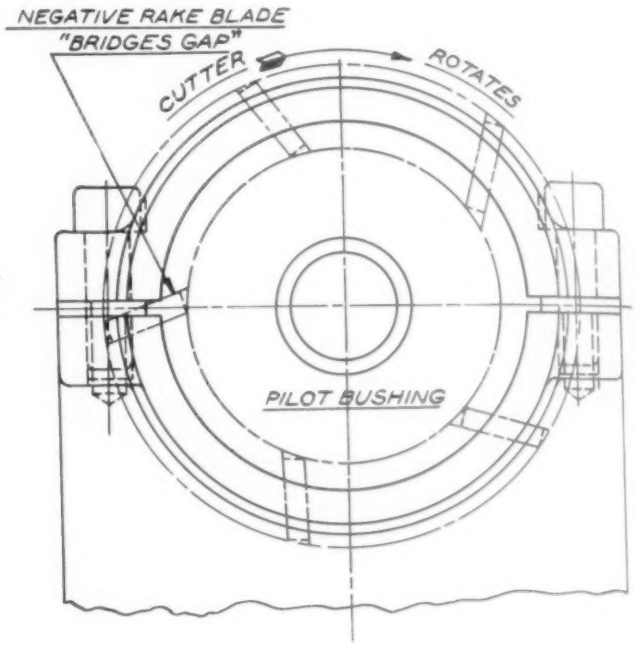


FIGURE 1. Looking through cutter at wheel.

NEGATIVE VS. CONVENTIONAL RAKE

DESPITE all the publicity given to negative rake, and the interest evinced, cutting tool manufacturers seem generally loathe to recommend it, and users equally reluctant to apply it. One reason is that, although conceived decades ago, it was too "radical" for general adoption during the cut-and-try era. Even now, it's *something new* to be cautiously applied. Another reason is that no particular standards for rake and clearance angles have been established, since what works in one case may fail utterly in another. Yet, while not a cure-all, negative rake is here to stay and is destined to play a revolutionary role in future metal processing.

Hyper-Milling, sponsored and introduced by Firth-Sterling, is proving highly satisfactory in milling operations and has been adequately proven out in various modifications. In the writer's experience, one job proved an "impossibility" until negative rake was resorted to.

Figure 1 shows a facing operation in which the part is shown head on, with the cutter in "phantom." Seemingly an easy operation, the part had hard spots—or a hard scale— on the periphery, which ruined cutters as fast as replaced. The operation was further complicated by diametrically opposed gaps which, to all practical purposes, constituted an interrupted cut.

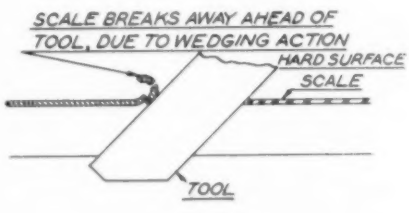


FIGURE 2.
Schematic outline of scale breaks.

While quite obvious that radially set blades would fail, conventional high speed cutters were tried at the outset and, cautiously used, served during the interval of waiting for special tools. As first conceived, these cutters were made with a 15 degree negative rake (shown in Figure 1) which bridged the gap and provided a fairly shockless cut. They also permitted a considerably higher surface speed, but this was merely comparative as the cutters failed as soon as a hard spot was encountered. Carbides and cast alloys chipped or fractured outright, and high speed steels of every known composition dulled on contact. Finally a fairly satisfactory solution was arrived at by the use of blades made from Tantung "G", a product of Vascaloy-Ramet. These permitted a cutting speed of 60 feet per minute as against 40 for high speed steel, and gave promise of ultimate success. While speeds were obviously slow, the

main consideration was to get cutters that would stand up.

A development, while possibly too recent for general recommendation, may be the answer to the whole puzzle. Some years ago, the writer was faced with a similar poser, in which cutters failed because of hard surface scale—although mild compared to some of these government alloys we contend with today. Acting on the somewhat speculative proposition that a cutter could not be damaged if it did not come in contact with the scale, a tool was designed as shown in Figure 2. It worked! — actually "wedged" the scale away before the tool came in contact with it. While it had its faults, it inspired the 45 degree negative rake facing cutter schematically shown in Figure 3, of which more later if it shows outstanding rather than average performance. As aforesaid, it hasn't been "through the mill" long enough for enthusiastic recommendation. However, it gives promise of highly satisfactory performance. (Note the partial slots for blades). Slots all the way through would result in "dishing" of body when locking wedges are tightened.

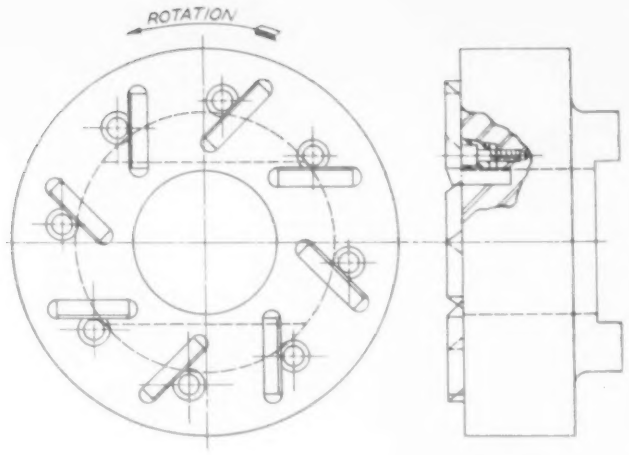


FIGURE 3. 45° negative rake facing cutter.

One object of negative rake is to bridge short gaps — as the shimmed space between bearing caps — and to reduce the shocks occasioned by interrupted cuts in general. It also has the faculty of prolonging tool life on straight turning and boring. In general, its features have been previously described in THE TOOL ENGINEER, but elaboration may not be amiss. Figure 4 shows a rather conservative negative rake tool on a straight turning job. Note that the chip is broken at the "heel" (marked by arrow) and that the point is flatted, the land being the approximate width of the chip thickness. That way, the point acts merely as a sizer for diameter, the pre-flatting being tantamount to the wear which would ordinarily take place as soon as a sharp point engaged the work. While the top rake can vary from 10 or 15 degrees to 45, the writer has found that a lead angle — or side rake — works best at about 15 degrees.

Figure 5 shows an extreme negative rake tool bridging the gap between bearing halves, while Figure 6 shows application on an interrupted cut. Negative rake does not work particularly well at slow speeds, hence, its use should start with high speed steel, preferably the tungstens. It is especially applicable for cast alloys — such as Rexalloy, a product of Crucible Steel — and here the sintered carbides may easily spell the difference between long life and outright failure. Yet, as far as the writer knows, only one maker of sintered carbide tools — Carboloy Company — has actually presented such a tool to date. It is a lathe tool with 40 degree negative rake. However, makers in general evince keen interest and engage in considerable research and missionary work — perhaps with a view toward educating users before introducing models. Of course, negative rake alone does not suffice; there must also be adequate tool support and rigidity to reduce vibration. Methods of tool support, on boring bars, were shown in November issue of THE TOOL ENGINEER.

ELABORATION ON BORING BARS

Since publication of THE TOOL ENGINEER's November article — *"Boring and Boring Tools"* later development may prove of interest to tool engineers concerned with precision boring. Figure 5 in that article (reproduced here as Figure 7) showed a quill type design in which the bar rotated in plain bushings in the quill. The quill, in turn, had reciprocal sliding motion only in a guide bushing. This design has the advantage that a lesser running fit is required due to the smaller spindle; with a close slip on the quill O. D., this greatly reduces initial error. Also, rotary and reciprocal wear is

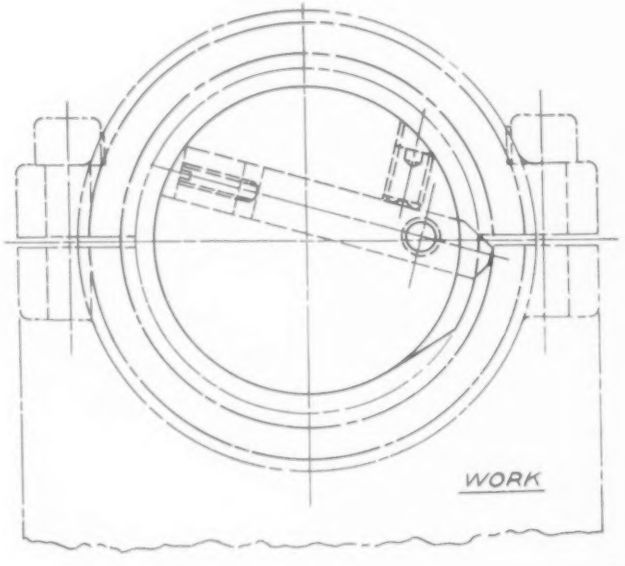


FIGURE 5. Negative rake boring tool bridges gap.

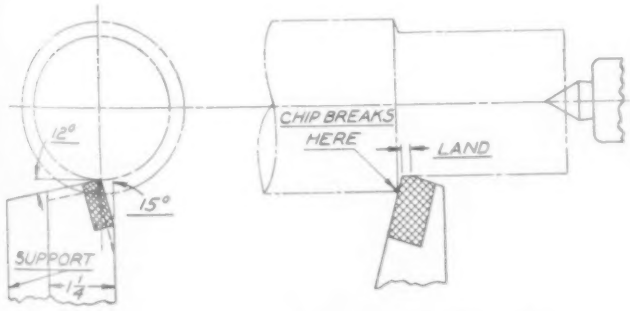


FIGURE 4. Negative rake tool on plain turning.

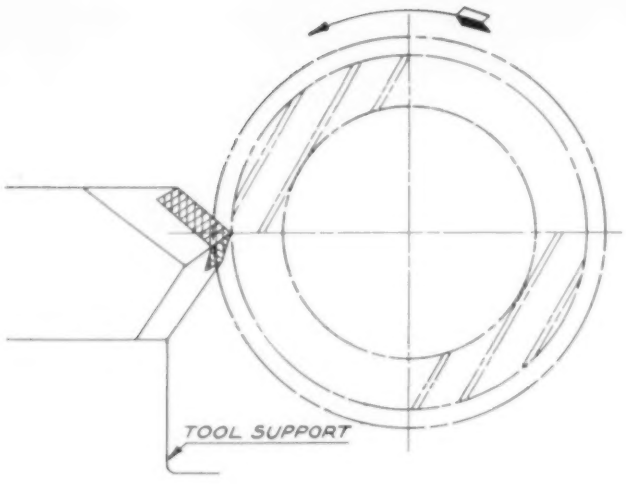


FIGURE 6. Extreme negative rake on interrupted cut.

distributed between separate bushings. Note alternate dovetail slide in broken lines. It is preferable to outer bushing guide.

However, we have to concede some initial play, else the bars would freeze, and wear is a foregone conclusion, further impairing accuracy. Nor does replacing the bushings entirely restore the original near accuracy; to effect that, the bar would have to be reground. A boring bar as shown in Figure 8 obviates these faults. Here, extra-precision ball bearings are used instead of plain bushings, with cutter head and driver as separate units. This design provides considerable flexibility.

As shown, the tool is adapted to a hydraulic bore unit, although the driver may be made to suit various machine spindles. The separate cutter head provides for possible changes in the part to be bored, besides anticipating possible damage. Any part may be replaced without affecting the whole. Evidently, the spindle will not wear, since the bearings are pressed on, nor will the front housing, since the outer race is locked, while the rear housing will wear only from the slow "creep" of the floating bearing. The ball bearings will remain accurate over an extended period, and should they fail, they are likely to go suddenly and unmistakably. That is better than to be teased along with borderline inaccuracies.

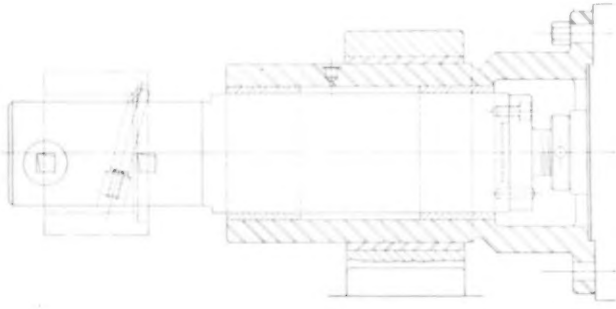
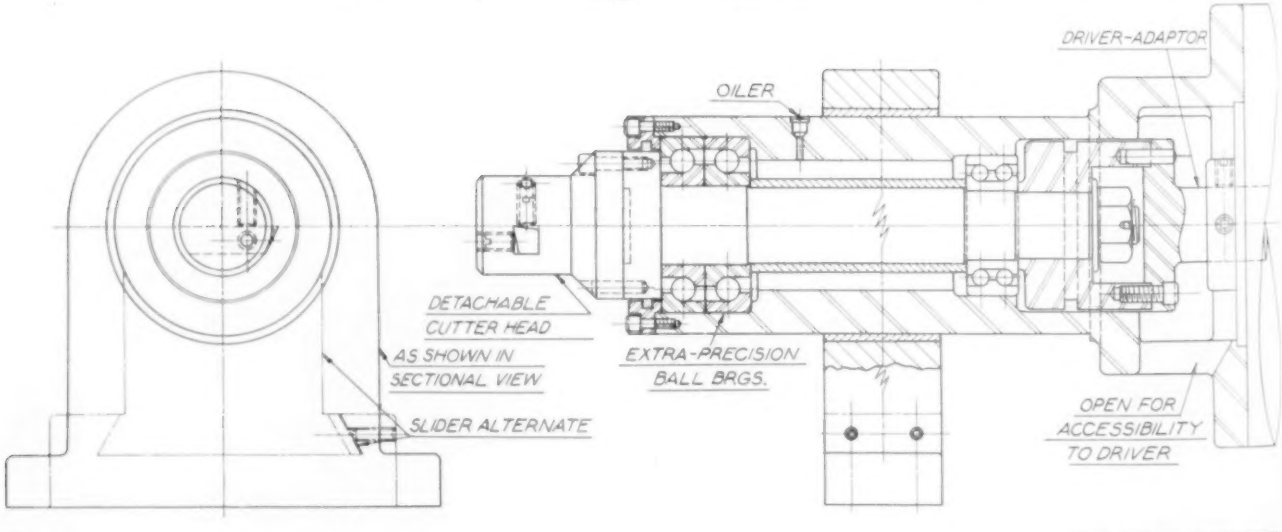


FIGURE 7. Reproduced from November issue for purposes of comparison.

◆

Below: FIGURE 8.



SIDE LIGHTS ON DRILLING

A question—"How far should a drill bushing be from the part for the best results?"—brings up others in turn. *What is the application? — the material to be drilled? — the accuracy required? — the size of the drill* and so on. Of course, one can advance the usual recommendations contained in the text books, but the only satisfactory answer is that the application should suit the job. And the job must be studied. For example, the closer the bushing to the work — flush with it, preferably — the greater the accuracy attained. This is especially true when drilling convex parts, as tubing; when so bushed, the drill just can't "walk." See Figure 9.

Now, what about material? If it is cast iron or other brittle composition —as bearing bronze — the chips will easily clear through the drill flutes, whereas a tough alloy may wedge, with wear to bushings and possible breakage of drills. In any event, an installation as shown in Figure 10 is a palpable "wrong" in that it provides a pocket for chips to wedge in. A practical method for diverting chips is shown in Figure 11; here, a 45 degree male chamfer, almost to the I. D. of the bushing, "bends" the chips away from the flutes and, consequently, reduces bushing wear. For especially tough material, "chip breakers," in the form of serrations, can be provided to break up curling chips.

To the unitiated, a few pointers are in order. When drilling and ream-

ing in the same jig, the drill bushing may have considerable end clearance whereas the reamer bushing were preferably close to if not actually flush with the work. That way, the reamer will the easier correct any misalignment or error, enhancing accuracy. Bear in mind that a large drill requires a proportionately shorter bushing than a small one. The larger drill is stiff, resists bending, whereas the smaller must be supported against bend. For example, a 1 inch drill may work with a bushing only as long as its diameter, while a 1/32 inch drill would require a bushing about 3/8 inch long. And for accuracy, the latter should be bushed to within about 1/16 inch from the work.

One reason for recommending close bushing is because of the relief taper on the drills; they gradually decrease in diameter from lip to shank. Hence, a 1 inch drill, as an example, will fill a bushing when new, but as it is ground back there will be an increasing increment of play. Considering all that, accuracy in drilling is only comparative at the best. However, accuracy within reasonably established tolerances may be maintained provided that due consideration is given to all the factors involved. Well, these are generalities; as aforesaid, the best way to arrive at a conclusion regarding drilling is to study the job and design accordingly. Ordinarily, one can't go very far amiss if setting up to tabulated recommendations, however, these cover average conditions, not the unusual application.

FROM METAL TO FIBRE

Another question came in regarding the milling of fibre. Well, the machining of fibre presents certain difficulties, due to abrasive qualities in the binder or glue used. One correspondent claimed indifferent success with both carbon and high speed cutters — they didn't "stand up" — while carbide cutters had a tendency to fray the work.

While the writer has not had occasion to mill fibre since the introduction of sintered carbides, the fraying seems unreasonable provided that the cutters are properly ground. Actually, fibre cuts the better for high speed and comparatively slow feed, and carbides should certainly provide the speed. However, the cutters should have more side and end clearance than is used for metal, and preferably, should have the teeth alternately staggered so that knife edges can be presented. Figure 12, shows a cutter ground for slotting. In other words, the material should be "shaved," more or less as one slices with a knife. These recommendations were passed on to the correspondent, who wrote back and said that results were highly satisfactory.

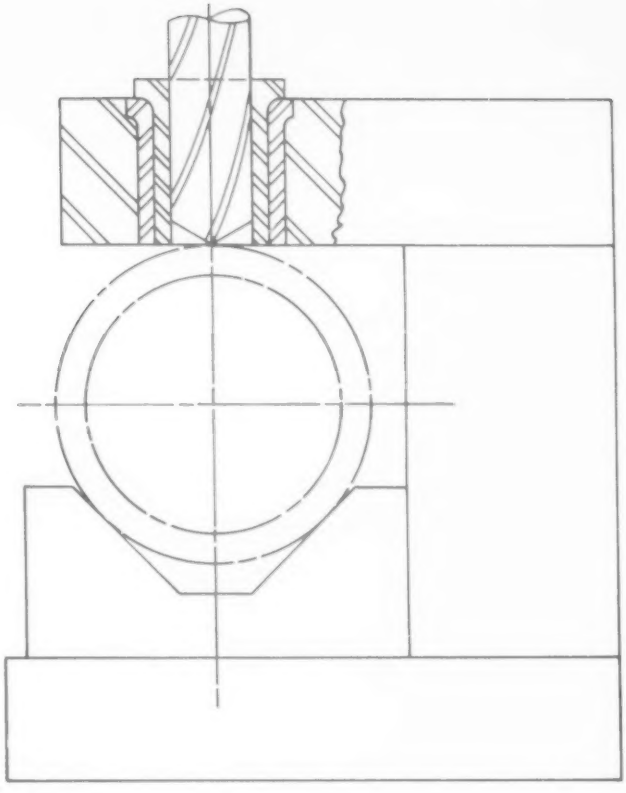


FIGURE 9. Bushing close to work to prevent "walk."

WITH WHAT WILL WE CUT?

A frequent question is "What kind of steel — or alloy — is best for metal cutting?" Speaking in the first person singular, I don't know. And if you ask the "peddlers," they'll usually recommend their own brand provided that conditions are favorable to its use. Yet, I have found few if any who will condemn a competitive brand; on the contrary, the most are quite unbiased and may be relied on to pass recommendations best suited to the job to be processed. For that matter, few makers will suggest installations that might react unfavorably on future sales, hence, their field men are *sales engineers* with practical experience rather than just mere salesmen. A wise man will listen to

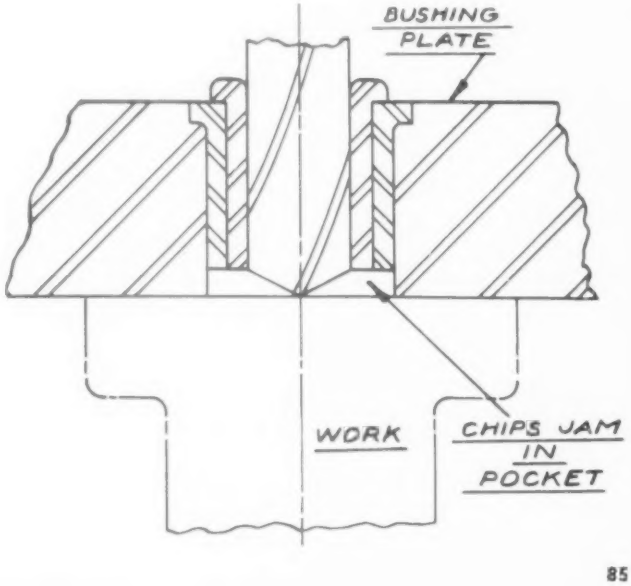


FIGURE 10 A "wrong."

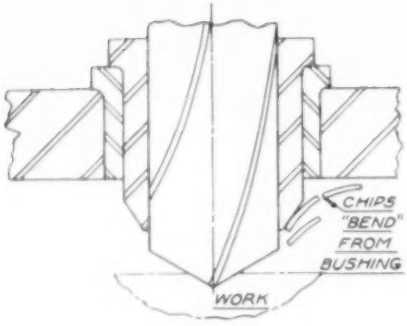
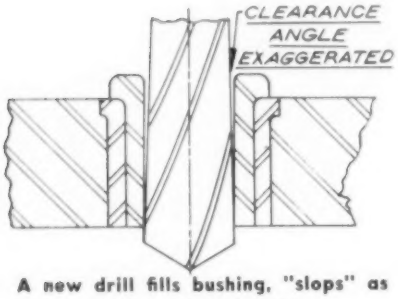


FIGURE 11.



A new drill fills bushing, "slops" as drill is ground away.

them, with profit to himself and his employer.

For reaming, or for fine finishes in general, carbon steel is undoubtedly best, provided one doesn't require high production. But, one can also get comparatively fine finishes with high speed or carbide cutters, provided that they are honed after grinding. Of course, one can't always super-finish or diamond lap, but there is always the reliable if slower oil stone. A good way is to rough with an India stone and finish with a natural, as a Wichita. Of course, if one wants the ultimate in bore finish, one either diamond bores or hones—*the question is*, what kind of finish do you want, commercial or superfine?

There is prejudice, in some quarters, against the sintered carbides, but this may be due to unfamiliarity or faulty application, in which case all carbides are condemned because of the failure of one. It is utterly contrary to reason, for example, to use a carbide tool — or any of the cast alloys, for that matter — without rigid support under the tool. Besides, the form of tool bears considerably on its success, and, actually the sintered carbides come in so many grades that one has a considerable choice.

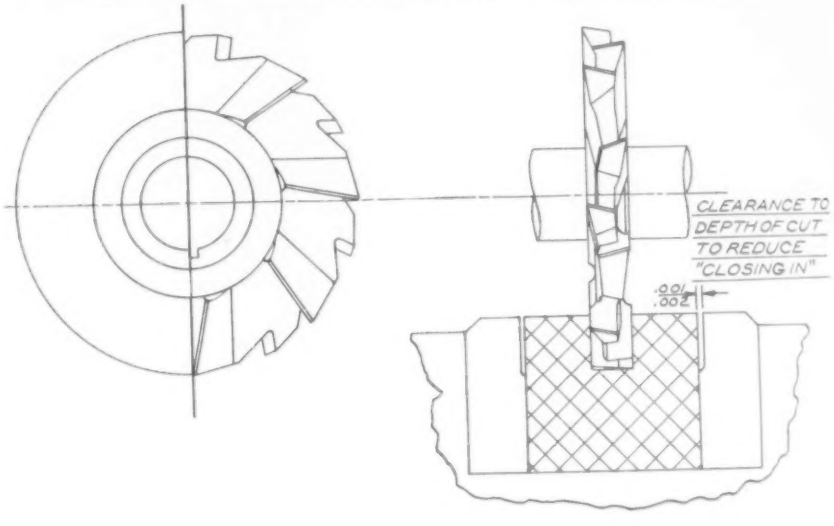
It is the writer's belief that we haven't scratched the surface of carbide possibilities. Even today, they are standing up under adverse conditions and interrupted cuts that would tax almost any tool to the utmost, and at speeds that no other cutting composition can approach. If there be anything that combines the speed of carbides with the toughness of high speed the writer will gladly be enlightened.

One composition that will bear considerable watching is Hardsteel, product of Black Drill Company. It just "burns" its way through a Nicholson file and may have considerable scope in turning and boring if used as brazed-on tool bits. It is fragile, but then, so are all of the cast alloys. In this connection, Crucible Steel is now out with brazed-on Rexalloy bits, a trend which will doubtless be followed by all makers of cast and compressed bits.

Properly used, however, and properly set up, almost any of the current steels and alloys will function within the ranges of speeds and feeds recommended by the makers. That is, for the ordinary materials. It's when we start monkeying with armor plate and some of the new fangled government alloys that our troubles begin. But even here there's a way out provided one sets out to find it and has the perseverance to follow a trail to its conclusion. For every practical problem its practical answer.

THE END

FIGURE 12. Sharp, alternately-staggered cutters work well on Fibre.



CLAPPER BOX USED ON VERTICAL BORING MILL

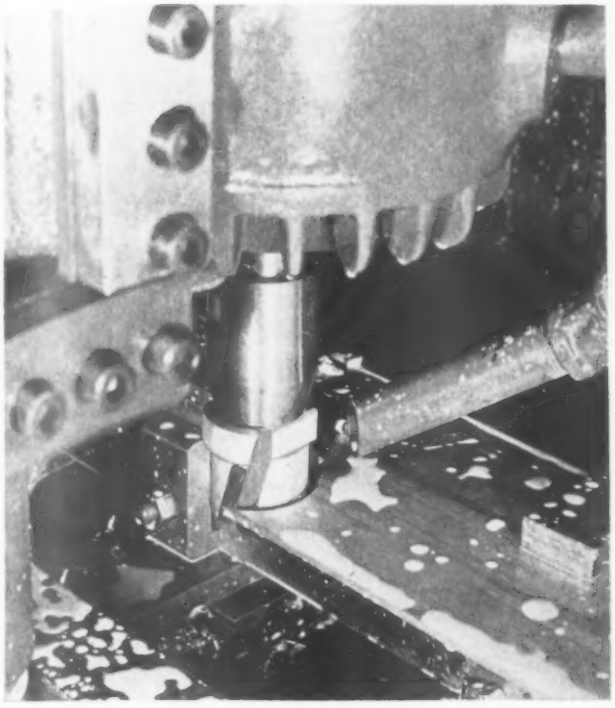
● A clapper box on a vertical boring mill is saving five hours in the machining of a 60-inch ring for a piece of ordnance equipment being manufactured at one of General Electric's Works.

Although a clapper box is common to other types of machines such as planers and horizontal millers, use of the hinged tool-holder on a vertical boring mill is unique. The method of application was suggested by E. M. Reamy, a machine operator who, in his 24 years with G.E., also has had 43 other suggestions adopted.

The idea is as simple as it is effective. The 60-inch ring has two six-inch high lugs opposite each other. Formerly, the procedure was to run the table around to a lug, stop the machine, raise the head, run past the lug, lower the head, and start the machine.

Use of the clapper box simplifies the operation. A pulley arrangement enables the operator to easily raise the tool to clear the lugs without stopping the machine. In the down position, the cutter is held in place by pressure of the cut. Experiments have shown that even if the operator should fail to raise the tool in time to clear the lug the only damage is a broken tool.

High Speeds and Feeds for MILLING ALUMINUM



Curtiss-Wright Photos

Front position — Milling a spar cap, cutting clearance on outer flange. Depth of cut 2¾. Diameter of cutter 2¼. 10,800 RPM. 20 feet P. M. feed.

Back position — Milling a spar cap, cutting clearance on outer flange. Depth of cut 2¾. Diameter of cutter 2¼. 10,800 RPM. 20 feet P. M. feed.

R. H. ASHCRAFT
CURTISS-WRIGHT CORPORATION

THROUGH DESIGN of a new cutting tool, an improved method of milling aluminum has been developed by the Curtiss-Wright Corporation's Airplane Division whereby aluminum can be milled faster and with a better finish.

This method differs from the standard practice of milling, and can be used wherever speed and feed justify carbide-tipped cutting tools. Usually, high speeds and feeds make working by the more conventional methods either difficult or impossible.

While the usual milling cutter might be compared to an ordinary carpenter's chisel, in which the tool digs into the work, the new tool is comparable to a carpenter's scraper, in which the angle of the tool is reversed. In some respects it is like an ordinary milling cutter working backward, with teeth reversed, at a much higher speed.

The machine on which these methods are applied is an Onsrud A-80 spar milling machine with one horizontal head (5,400 RPM) and two vertical heads (10,800 RPM), all powered with 15 hp. high-cycle motors, and with a variable carriage feed from two to 20 feet per minute.

Speeds and feeds on this machine were much too high for tool steel cutters or like materials. Carbide was the practicable alternative. This in itself presented a problem because the required width of cuts range from ¾-inch to three inches, and from three feet to 10 feet in length. Machine speed, which is constant, prevented using an inserted clamped-in blade or tip. Instead, a silver soldering or brazing method is necessary.

In attempting to adhere carbide to a dissimilar material, stresses and strains were set up between the cut-

Carbide tips, with negative rake, brazed or soldered to high-grade malleable iron bodies, permits 200 per cent increase in grinding life, gives more speed, better finish.

ting blade and the body holding it. Extensive research disclosed that high-grade malleable iron could be made into a cutter body of density and strength, as well as one with a coefficient of expansion and contraction comparable to that of carbide. The result is an undistorted tip in brazing the tip or blade to the body.

The two-fluted cutters of six-inch diameter (shown in Figure 1), with flutes set in, is silver soldered on a 15° spiral and is ground to a 5° negative rake angle. The advantages of this negative rake are manifold. The cutting edge is greatly strengthened because a lip angle at approximately 90° is used. The center of cutting pressure is some distance behind the cutting edge. The negative angle (Figure 2) delays cratering, pitting, chipping and wear.

Higher cutting speed

Conventional cutters present the weakest point of the cutting tooth to the work, while teeth with negative angles shear off the metal. Thrust is exerted against the bearing, instead of a pulling action against the end-play adjustment collar, as with a positive-angle cutter.

Using this cutter, the milling rate is 8,482 surface feet per minute at 5,400 RPM. Using fewer teeth than ordinary milling cutters provides adequate chip space and, at this high cutting speed, the volume of chips produced in unit time far exceeds that of conventional cutters. The coarse pitch also permits use of thicker tips and thicker blades, both of which are desirable for the process.

While the negative angle theoretic-

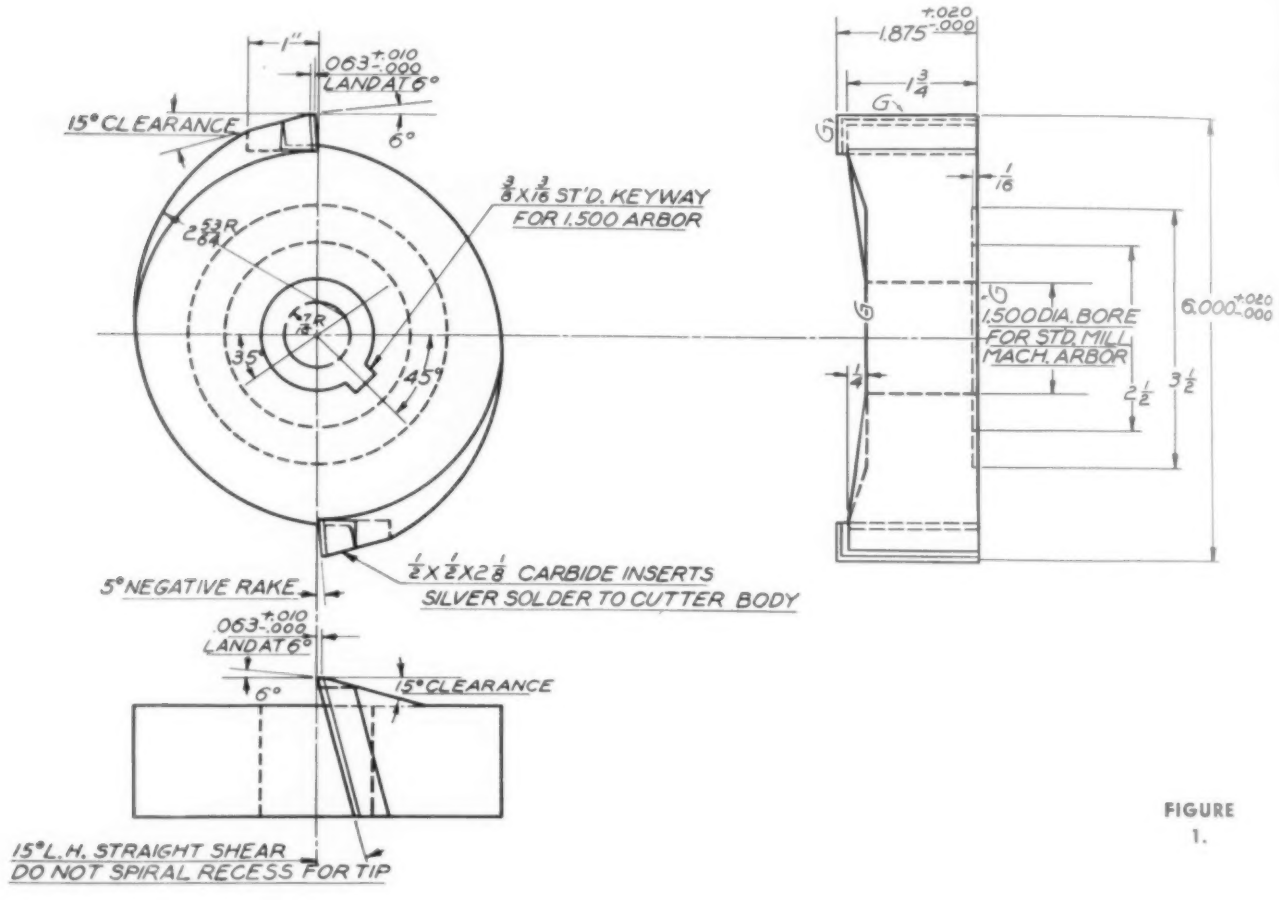


FIGURE 1.

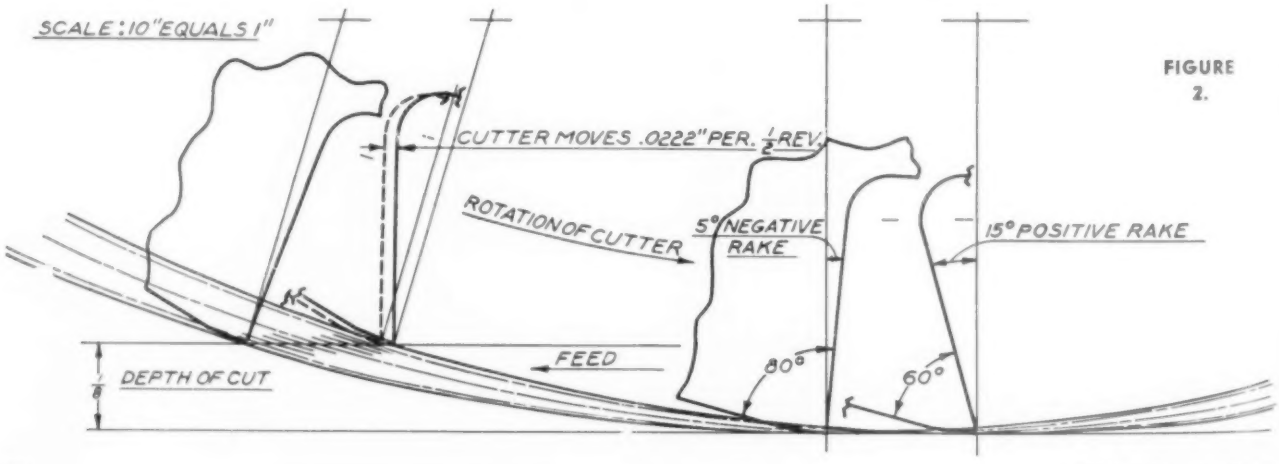


FIGURE 2.

ally traps the chips and obstructs their escape from the region of the cutting point. The extremely high speed causes rapid flow across the tooth face.

An important factor in the new method is that high speed and feed limit the heat generated and also the rate of heat transferred, so that the chips dissipate heat without communicating it to the cutter or to the work in any appreciable degree.

In applying this method, best results are obtained with modern machines and a specially-designed cutter. Older machines can be utilized, provided the necessary speed is available.

Grinding life increased

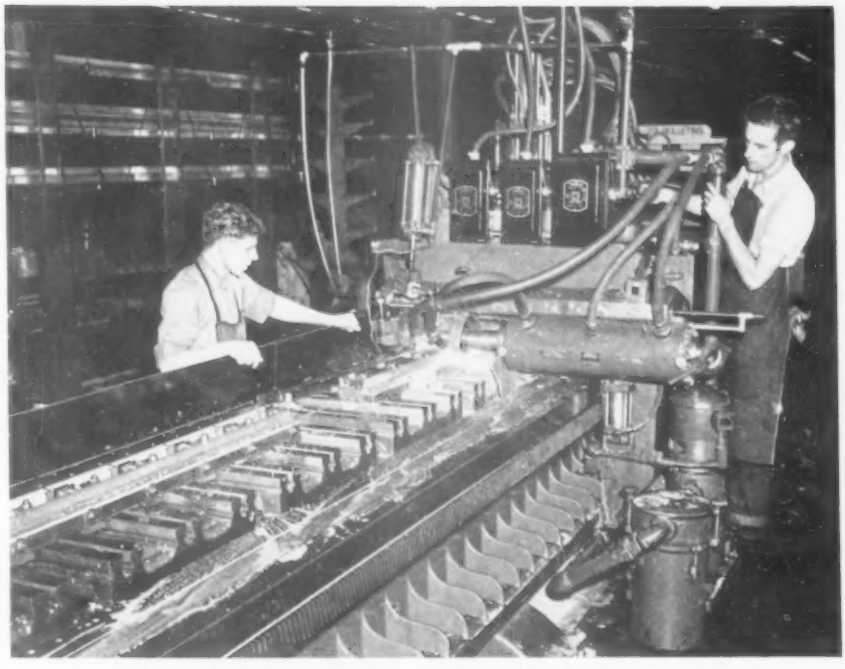
Frequently, a conventional milling cutter can be used by removing some of the teeth, providing needed chip space, and grinding a negative rake on the face of the teeth.

This negative rake, although very unusual in cutting aluminum, has resulted in a highly efficient cutter, affording a 33⅓ per cent stronger cutting point and a 200 per cent increase in grinding life over a standard setup.

Time has not permitted testing these cutters for their maximum ability. However, the number of pieces obtained per grind has been astounding, far exceeding expectations.

Important now, less time is spent in regrinding, resetting and on breakdowns resulting from the use of improper tips and incorrect grinding.

THE END.



Milling of a spar cap *(two at a time, left and right)* on the Onsrud spar miller is shown in this photograph taken in a Curtiss-Wright Corporation plant. Depth of the cut is 3/16 of an inch and diameter of the cutters used is six inches. The special tool developed for this operation permits milling of aluminum at a much faster rate (8,482 surface feet per minute with 20 feet per minute feed) than has been possible previously.

Collectable Dividends

LEO P. T. JACQUES
TOOL SUPERVISOR
SPRINGFIELD ARMORY

MUCH IS WRITTEN about proper wheels, proper clearance angles and general care in grinding; too little about finish, care after grinding and feeds and speeds.

Much poor performance blamed on faulty grinding can be traced directly to poor finish, improper storage and lack of knowledge of proper speeds and feeds.

Proper finishes in grinding are most desirable. Usually, the tool grinder, after selecting a wheel, sets up to the recommended clearance and proceeds to grind. From time to time, he inspects the piece on which he is working. Assuming that the job is being done properly, he finishes it, and the tool is put to work. But, no man's unaided eye is able to pick up minute finish imperfections.

Using a four power magnifying glass, any grinder can check poor finish to an extent that will reduce remarkably the rate of return of tools to the grinding room. And a good glass is bound to pay far higher dividends than a poor or cheap one.

A good microscope is another grinding room necessity for the use of the foreman or tool inspector in making periodic inspections. It is of invaluable assistance in correcting imperfections in wheel selection or grinding technique, which though not immediately noticeable, account for a considerable amount of tool failure over the long run.

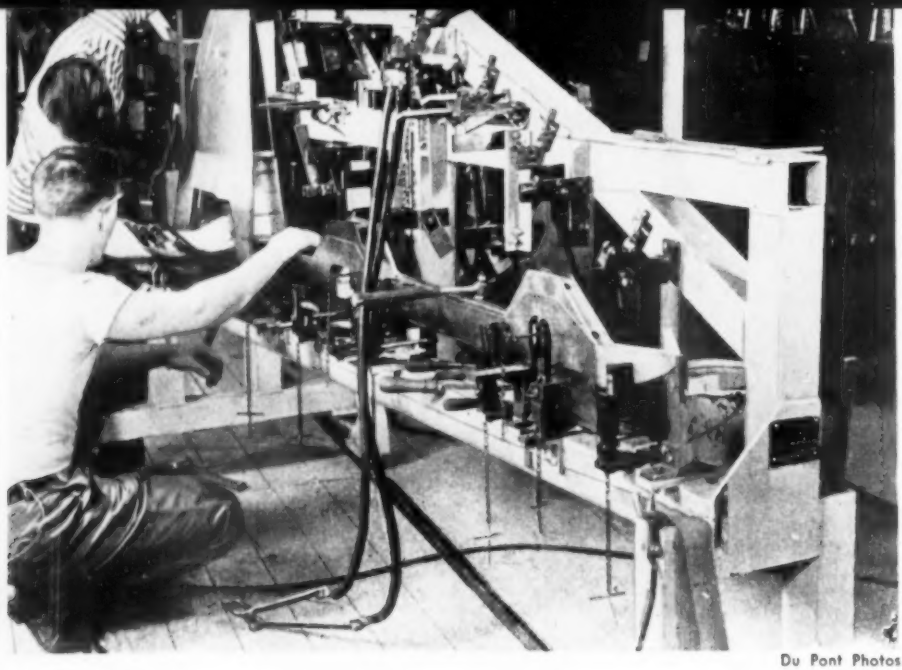
It is generally agreed that extra-fine finish (THE TOOL ENGINEER, October '42, *"Tool Life Increased 20 Times"*) produces good results, but is there in every plant the time to teach the required methods, to perform the operation? There is time, almost invariably, however, to check tools carefully with a good glass before returning them to the job. Such a check can result in surprising cutter grinding efficiency.

Care after grinding can also increase cutter life. The manufacturer that supplies tools carefully wraps and boxes them to protect cutting edges. Tools which go on the job nicked, or never get there because they are broken in handling, are a liability in excess of the cost of proper care. Boxes, wooden pegs or adhesive (not surgical) tape offer suitable means of caring for cutting tools. Using tape has proved practical particularly where space conservation is a factor.

Speeds and feeds must be correct. The tool engineer or tool supervisor who takes time to figure surface feet, RPM, and correct depth of cut to produce the chip per tooth to suit each application will increase tool life.

Plants which have applied these measures toward tool conservation have increased production day by day, with a minimum of trouble.

THE END.



Du Pont Photos

Left—A difficult illumination problem — lighting the underparts of airplanes being constructed — was solved by painting the floor of the assembly line in light colors.

"SPOTLIGHT" COLOR RECOMMENDATIONS FOR MACHINERY MANUFACTURING AND FABRICATING SPECIFIC MATERIALS

	Spotlight Buff	Spotlight Green
ALUMINUM	X	
BRASS		X
BRONZE		X
CHROMIUM	X	
COPPER		X
COSMETICS		X
IRON	X	
LEATHER	X	X
MAGNESIUM	X	
NICKEL	X	
PAPER		X
PLASTICS	X	X
RUBBER	X	
SILVER	X	
STEEL	X	
TEXTILES	X	X
TIN	X	
WOOD		X

Contrast Color Painting: Key to Safety and Speed

WITH MORE AND MORE EMPHASIS being placed on increased production at a time when the manpower situation is critical, mass production engineers frequently are faced with the problem of getting larger output without being able to employ more workers or acquire desired new machinery.

The three main factors in production — men, materials and machines — are definitely limited today, with men the controlling factor. Upon their speed, accuracy and continued performance depends the success of our war production program.

If seeing and working conditions are properly provided, skilled machine operators work quickly, efficiently and safely. Yet despite the importance of providing such conditions, many manufacturers have failed to do so.

In investigations in some war plants of the effect of lighting conditions on output rate, Arthur A. Brainerd, Supervisor of Lighting Service Section, Philadelphia Electric Company, found that light is "blotted up" by dingy walls, ceilings, floors and by dull colored machinery.

Machines in industrial plants have generally been black or dark gray. They are dull and drab, absorbing much of the light that falls upon them. More important, however, is the lack of distinction between the machine and its operating parts—and between these parts and the work being done.

The color of a moving part — drill, punch, saw or cutter — often blends into the rest of the machine and the material being worked. It is a real hazard to workers, for there is no positive visual warning to indicate to the operator when he is getting too close to the moving part which may cause him serious personal injuries.

As a result of these investigations and considerable research, Brainerd, in collaboration with the Du Pont paint technicians, developed a new and scientific method of using color and light in the right combination. As first publicly announced at the thirty-fifth annual convention of the Illuminating Engineering Society at Atlanta, Georgia in September 1941, its principles have since been widely

A "Three-Dimensional Seeing" color treatment of the machines combined with light reflected from the floor increased visibility at the working area. Color transformation doubled utilization of illumination.

A method to improve visibility on production machinery by spotlighting working areas with contrasting, light colored paints.

adopted by industry.

Known as "Three-Dimensional Seeing", according to DuPont this new science satisfies the two basic requirements — brightness and contrast — which makes strainless, full vision possible. By painting machinery in colors having high light reflection qualities and contrasting hues, machines become "light-reflectors" instead of "light robbers."

Operators see their work in three dimensions, sharp and clear. Errors and rejects it has been found decrease sharply; flaws are more quickly and readily spotted. Increased production, uninterrupted by accidents or eye fatigue is a natural result.

Since its introduction more than a year ago, "Three-Dimensional Seeing" has been widely practiced. Government Arsenals and Ordnance Plants and hundreds of war contractors are successfully employing it. Du Pont engineers report that without exception, users are enjoying substantial increases in production (as much as 15 per cent in many cases), with greater operating efficiency, less fatigue, and fewer accidents.

"On-the-Job" tests

In a series of tests conducted in war plants, it was found that light gray is the most desirable color for bodies of machinery when combined with a suitable contrasting hue, such as buff, for danger points.

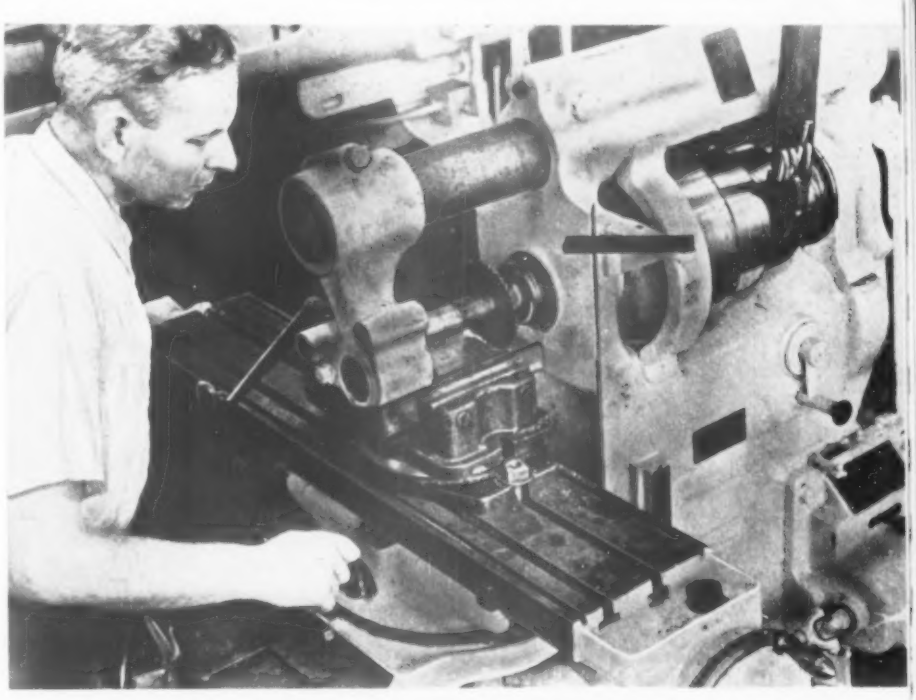
On the basis of this research, it is also claimed that the soft contrasts created by such a combination are easier on the eye than abrupt changes in brightness; these colors stand high in reflective qualities; operating time is faster and more efficient because the lighter tool area concentrated attention on the work and spotlighted danger spots; workers react more favorably to this pleasing combination than to any other colors tested.

The two colors which first made possible this effect were named by Du Pont—Spotlight Buff and Horizon Gray. While Spotlight Buff was designed for machine tool operations on ferrous metals, experience has shown that it is also satisfactory for other industrial operations.

An additional color — Spotlight Green — was developed in response to a demand for another color. The three standard colors are said to adequately fulfill the requirements of most manufacturing operations.

Walls, ceilings and floors painted in colors that are high in reflection value, "bounce" the light from one surface to another. The floor of one large machine shop was finished with a gray paint having a reflection factor of 60 per cent. The color change, alone, increased illumination considerably. Moreover, it improved good housekeeping. Tools on the floor became so obvious that workers voluntarily picked them up.

The floors and tables along the aircraft assembly line of Fleetwings, Incorporated were painted in light colors. The light floors served as a reflecting "ceiling", from which the light bounched up, affording good visibility on all sides of the parts under construction. THE END.



BEFORE a "Three-Dimensional Seeing" treatment, this machine was the same dull color as the material being worked. This "camouflage" results in errors and injuries.

AFTER the machine body was painted with Horizon Gray and the working surfaces with contrasting Spotlight Buff, the material being worked stood out sharply.

PLASTIC PUNCHES

FOR DROP HAMMER AND HYDRAULIC PRESS

CARL HILL
and
JOHN McCANLEY
TOOL RESEARCH ENGINEERS
VEGA AIRCRAFT CORPORATION

MORE CONSISTENT FORMING of sheet metal parts and more rapid production of such parts in the drop hammer or hydraulic press can now be accomplished through the use of a plastic punch. Tough, elastic, possessing great impact strength, this new thermo-plastic is one-hundred percent reclaimable without sacrifice of physical properties.

Early in 1942 the Vega Aircraft Corporation, like many industries, was faced with the necessity of conserving critical metals. In an effort to find a desirable substitute for lead and Kirksite punches, a plastic product of the Plastalloy Company of Burbank, California, was utilized. First trials were promising, hence further tests followed, formulations being constantly altered to meet the high impact required for metal forming. Progress has been slow but decidedly encouraging. While some of the problems have not been entirely overcome, the method has reached such a degree of workability that results are here presented to the industry.

A brief review of steps necessary in making and using a lead drop hammer punch serves as a basis for judging the advantages of the plastic punch. Lead is cast to the Kirksite die without allowing for metal thickness of the part. Thus, the die must be set up in the hammer and the vertical surfaces scraped in to the die to allow for metal thickness.

The drop hammer is obviously out of production during the operation.

Further, it is often necessary to rescrape the punch after a number of parts have been formed because the soft lead punch tends to flatten and spread. Small radii on the punch are likewise beaten back, resulting in larger radii than obtained originally, so that rubber strips must be so placed in the die as to form the metal down to the small radii. Since this condition most frequently arises when as few as ten parts have been formed, production on the lot is appreciably slowed. An alternative is to run the whole lot through and then rehit the parts during a second run, using rubber. Either method involves a loss of time which is avoided when a plastic punch is used.

The plastic punch, like lead, is cast directly to the die, without clearance for metal thickness. Beyond this point, the simplicity and economy of the plastic punch method becomes apparent:

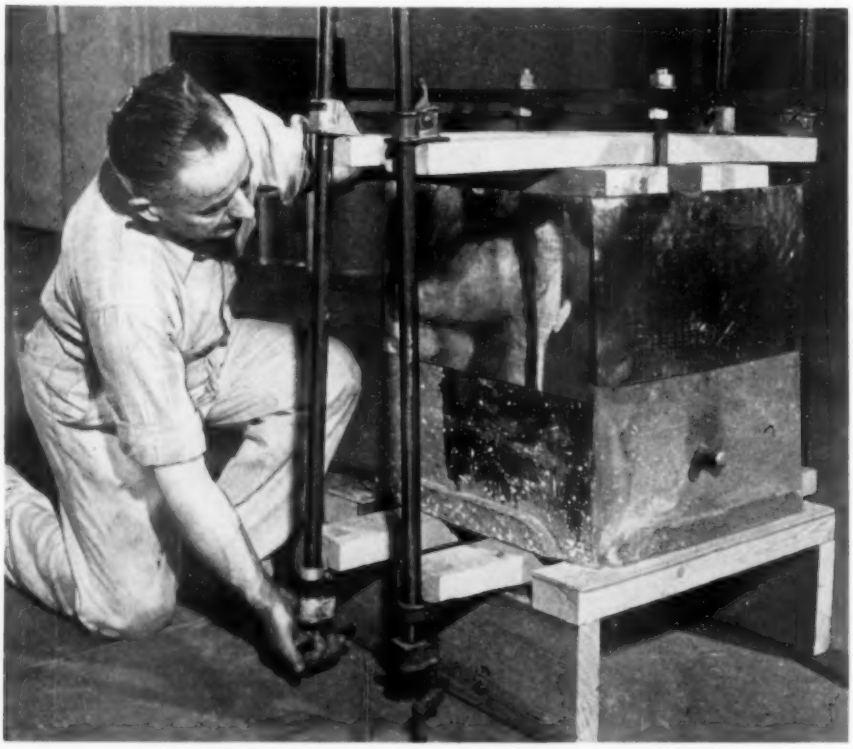
1. The punch and die are set up in the drop hammer.
2. Parts are then run.

It is unnecessary to scrape the punch into the die. Being elastic, it simply springs back to accommodate metal thickness of the part, recoil accounting for its excellent forming characteristics. The same qualities account for consistent forming of small radii, beads, and the like. It is unnecessary to use rubber strips to form beads. The useful life of a plastic punch has proved many times that of lead. In general, the plastic punch seems to possess the same characteristics as rubber under pressure and, when used in the drop hammer, combines the forming advantages of impact. It most consistently forms the part *true to the die*. Other savings in production time and expense are illustrated in the following box which compares a typical operation as performed on a lead punch and a plastic punch used at Vega.

By using a plastic punch an annealing operation and a rehit operation have been avoided. Foundry as well as drop hammer time is saved since it is unnecessary to pour a second punch.

Certain precautions are necessary

The material is made to shrink from the top of the punch down as it cools. This is done by means of standard cabinetmaker's clamps which apply pressure to a wood plate placed on top of the punch after first covering with metal. The material is thereby prevented from shrinking away from the die and is forced into perfect conformity with it.



NOTE: This article prepared from data compiled by Tool Research Engineering for the Vega Aircraft Corporation, in collaboration with Leon Champer, Chief Chemist for the Plastalloy Company.

OPERATION COMPARISON ON LEAD AND PLASTIC PUNCHES

•

Kirksite Die with Lead Punch

1. Hit approximately 100 parts one time.
2. Anneal.
3. Pour new Punch.
4. Rehit 10 parts.
5. Rehit 90 parts using rubber strips to force out radii. (From three to six rehits may be required to produce a satisfactory part.)
6. Finished.

Kirksite Die with Plastic Punch

1. One fairly good blow to set.
2. Three blows in rapid succession.
3. Finished.

when setting up the punch in the hammer in order to avoid subsequent cracking of the punch.

Threaded inserts located in the punch should line up with holes in the head of the hammer. Otherwise when the stud bolts which are screwed into the inserts are forced into the hammer, strains are set up in the plastic which are considerably multiplied by impact of the punch in use. Hole locations in the Vega hammers are not uniformly located, but this difficulty has been overcome by using ⅞ inch studs in the 1-1/16 inch holes. One inch studs are normally used in lead punches. Nuts used on these studs must be firmly tight only, not cinched up with tremendous pressure as when using a lead punch.

Since most breakage of punches has been found traceable to cracks developing at the metal inserts, these precautions alone have served to reduce such troubles to a minimum. Results are more successful, also, if Plastalloy is warm (around 75° to 100° F.) when set up in the drop hammer. These precautions should be observed even though the Plastalloy Company has now developed a material that the drop hammers, in most instances, have not been able to break.

Hydraulic press punches

Success in the drop hammer field led to the development of plastic punches for use in the double action hydraulic press. The long hours of tedious grinding required to fit the punch to the die and allow for metal thickness are avoided because, here again, the plastic punch is poured di-

Rubber strips, such as used here to form the metal down to the small radii when a lead punch is used to form parts in the drop hammer, are not required when a plastic punch is employed. Here is the time-devouring rubber strip method, which delay is entirely eliminated by use of plastic punch.

• It should be understood that plastic punches, in their present stage of development, cannot be used on all types of jobs, but those parts which are most adapted to this method of forming may be determined readily.

It has been found, for instance, that plastic punches, due to their rubber-like nature, do not iron out wrinkles as readily as lead or Kirksite. But, due to their close fit, fewer wrinkles occur in the first place. This type of punch is less successful, in many cases, in forming stainless steel parts. Often the same part, in aluminum, would form well.

Under proper conditions and within certain bounds of application, this material produces better and more uniform parts, and does it faster than other materials. The possibilities of this plastic development, in all probability, have not yet been thoroughly explored.

Experiments are now under way at Vega which, if successful, will make it possible to cast a die from a plaster pattern and cast a plastic punch into this die ready to put into work on a press, all with no machining.

After cooking, hot plastic is poured from cooking device directly to Kirksite die with which it is to be used in forming sheet metal airplane parts. Funnel prevents material lapping and air bubbles.

rectly to the die.

A limited amount of clearing of sides or shoulders is sometimes found necessary in order to secure better bottoming as, for example, when beads are to be formed in the bottom of a part. However, if this must be done it can be accomplished while the punch is in the press. In the case of the Kirksite punch and die they are pulled and later set up again for another trial. Thus the plastic punch saves press set up time.

Generally speaking, the punch is merely poured directly to the die and set up in the press ready to go. Due to its elastic nature the punch forms the part true to the die. Normal production difficulties are obviously encountered, but they are solved as any manufacturing problem. For example, it was found difficult to form a number of parallel beads located in the bottom of a certain Vega part. Good beads were obtained by merely increasing pressure. In fact, it was found that enough pressure could be applied to tear the part around the bottom beads. A comparison of the two methods of making punches is shown in the box.

COMPARATIVE METHODS OF MAKING PUNCHES

•

Kirksite Punch

1. Make templates.
2. Make plaster pattern.
3. Cast punch in sand, using mold taken from plaster.
4. Grind in punch to fit die, less metal thickness (time: 5 days).
5. Run parts.
6. Anneal.
7. Hit on drop hammer.
8. Rout (trim).

Plastic Punch

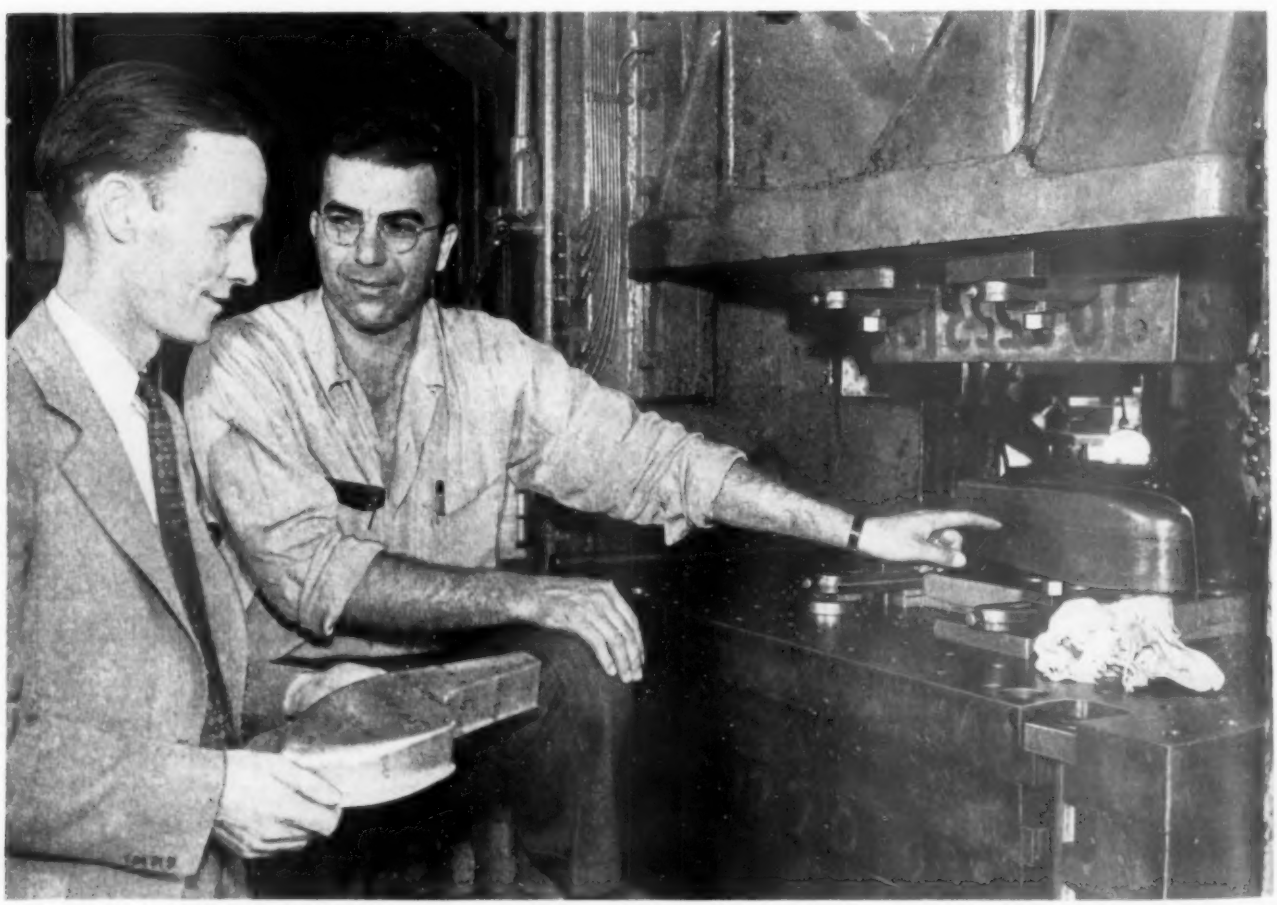
1. Pour directly to die.
2. Clear for metal thickness where necessary time: 3½ hrs.).
3. Rout (trim).

Casting plastic punches

IN CASTING PLASTIC PUNCHES, ordinary wood sides are built up around the die and the inside wood surfaces are lined with tin. Fillets are made with molder's clay. Sides usually extend about 10 inches above top of die, resulting in a thicker punch than is usual in lead. Experience has shown that impact is better absorbed and transmitted when the plastic punch is about 25 percent greater in thickness than would be a lead punch.

Two distinct Plastalloy materials are supplied and combined to form the final casting compound for punches. This is done to facilitate melting or preparation for casting. For convenience, these materials are termed Plastalloy "A" and Plastalloy "B".

Formed with plastic punch press at the Vega Aircraft Corporation Plant, in Burbank, this flap-track fairing is being inspected by J. A. Harris, foreman of the foundry, hammer and press department, left, and C. C. Miller, foreman of the same department at Vega Plant II. Plastic punch is cast directly to the die, and no grinding is necessary because the resiliency of the plastic makes it unnecessary to allow for metal thickness. More than 1000 parts have been formed with this punch.



Part formed on double-action press with plastic punch. By using plastic punch for this type of forming. Vega does a better job faster and more economically.

The former has a low melting point, while that of Plastalloy "B" is considerably higher. Plastalloy "A" is first melted to start a batch. When it has reached a liquid state, Plastalloy "B" is slowly added. The mixture is agitated from the start, and constantly during the "cook" to prevent burning. Reclaimed pieces may be added while the mixture is being melted. As mentioned earlier, the plastic is 100 percent reclaimable. Used or broken punches may be broken up and remelted as indicated above.

The mixture is heated to and maintained for about 45 minutes at a temperature of 205°C. (401°F.), at which time the heating agent is cut off and the mix allowed to cool to 175°C. (347°F.), being agitated continuously.

While at this temperature the melt is cast into the Kirksite die, being poured through a special funnel (tin or similar material), the lower end of which is kept below the surface of the plastic in the die. Lapping of the material, which tends to cause weakened planes, and trapping of air is thus avoided. Immediately after the punch is poured, the inserts, located by means of studs to a spider, are lowered into the punch to a predetermined depth. The top of the insert preferably should not lie more than one inch below the surface of the finished punch. Precautions that will insure normal and properly located inserts are: (1) level die; (2) spider parallel to die; (3) accurate spider; (4) holes for studs through spider to offer sliding fit yet hold studs close to 90 degrees. Attention given these details will, in a large measure, reduce possibility of breaking punch in use.

The material is made to shrink from the top of the punch down as it cools. This is done by means of standard cabinetmaker's clamps which apply pressure to a wood plate placed on top of the punch after first covering with metal. The material is thereby prevented from shrinking away from the die and is forced into perfect conformity with it.

Cooling requires considerable time depending upon the size of the casting, so that the total time required to prepare, case, and cool a plastic punch is more than that required for one of lead. However, when operations permit having a pot of mixture continuously ready to cast, as is done with lead, the over all time will be reduced about one-half, for it requires around six hours to cook up a batch.

The top surface of the cooled punch is not ordinarily smooth nor parallel to the base of the die. Therefore the punch is left in place in the die, after forms and clamps have been removed, and is surfaced parallel to the base of the die. This is done on a planer or similar machine although the operation might as easily be done by a simple set up using a hand router.

The plastic may be cut or worked with any kind of cutting tool. It is not abrasive and does not dull tools. Being a thermoplastic, it cannot be ground or sanded, and tends to gum up tools that generate heat rapidly, such as circular and band saws. However, it may be drilled, tapped, planed, or worked with hand woodworking tools. THE END

Tool Maker in Seven Weeks

From auto repair to tool making in seven weeks is the conversion story of a motor car dealer who got behind the war effort.

An ancient Monarch lathe which had outlived its usefulness as a lathe was converted to a grinder. It has been in use every day for almost a year, and works to a tolerance of .0001 in gear grinding.

SOON AFTER a duration death knell was sounded for motor car manufacture, the door on many a well-established automobile dealership was slammed shut and thousands of salesmen, mechanics and handymen started the inevitable search for new jobs.

In Springfield, Massachusetts, one dealership refused to close its doors, send its employees elsewhere for work. The Springfield Buick Company, with energetic vice-president and general manager, William C. Lynch, charting the course, started on a war production program the day of the auto ban. Seeking a coveted A-1-a priority, he converted the dealership garage into a full-fledged machine shop for the production of much needed tools and gages. He couldn't get a priority until he could show a real shop.

Age is no bar in war production. Seventy-year-old H. W. Hodgetts is shown at work on a shadowgraph in the gage inspecting section of the Springfield (Massachusetts) Buick Company shop.

Seven weeks after he turned to this task, Bill Lynch watched the wheels of his small plant humming night and day as a creditable flow of war production commenced from his one-time auto dealership. His is now credited as the first of an increasing number of such "converted" auto shops throughout the country.

Lynch searched all of New England for old machines. He advertised in many a small community suspected of possessing needed equipment. Two lathes, a milling machine and a drill press came out of a pretentious home in Lenox, Massachusetts, where they had been operated in a toy making hobby. Machines were found and shipped to Springfield that had been resting and rusting in cellars for years. While searching for such disused equipment to lay the foundation of his shop on a new car storage floor room, Lynch found "the woods are full" of old machines which might be brought back to usefulness in the war effort.

Less than two months after undertaking the task of setting up shop, old lathes, drills, planers and grinders were whining the familiar tune of a busy machine shop. Blueprints and raw materials were coming in. Tools and gages were taking shape. Men in uniform came to inspect the set-up. The Springfield Buick Company had qualified for the A-1-a priority.

Now, new, efficient equipment is being installed, barriers along the road to expansion have been removed. Operations are expanding past the original 4,000 square feet of floor space, into an additional 5,000 square feet.

The human element is so conspicuous in the story that it matches for interest the job of tooling. Seventy-two years, for example, was no deterrent to Thomas Stevenson when he applied for an opportunity to again ply his trade.

"I don't care how old my men are," Lynch says. "In fact, some of the old men do better work than the young ones. From habit they know what to do and they go right at it." Women are being employed as work for them can be laid out.

Special training

The similarity between an automobile repair shop and a machine shop is sufficient to make the transition from one to the other not too difficult. Yet the auto repair man cannot step into tool production or gage making without special training. A first-class master mechanic had to be employed. A number of expert mechanics were brought into the little organization and some of the repairmen were sent to local trade schools to acquire theory and techniques in the field.

Lynch points out that assurance of success in this field for the duration, as he saw it, lay in the ready market. The small tool making industry is pressed to the limit to meet vital war production demands. With tools wearing out at an accelerating rate in war production, Lynch believes there is a place for such new shops on many Main Streets.

THE END.

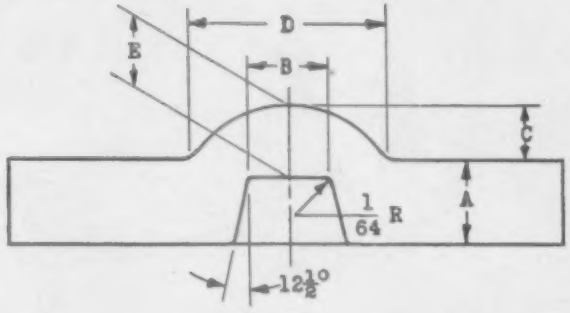
PRODUCTION DATA SHEET

DESIGN OF WELDING EMBOSSES AND LOCATING BUTTONS IN STAMPING MANUFACTURE

IN the December issue of THE TOOL ENGINEER was an article on the design of welding embosses and locating buttons by Stanley R. Cope, president of the Acme School of Die Design Engineering. Because of the interest evidenced in this article and many requests for reprints, THE TOOL ENGINEER reprints the tables showing proven dimensions of welding projections for different gages of sheet metal.

Too often has design been hit or miss, costly both in time and materials. By using these tables, the product designer will not only assure himself that the welding projections are correct in design and size, but will furnish complete instructions to the die designer.

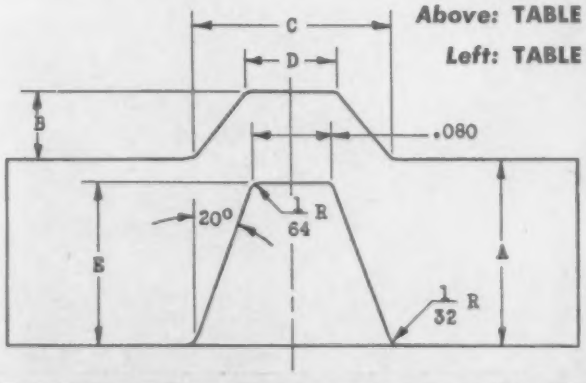
Both tables show complete dimensions for the emboss and depression. These dimensions enable the die designer to completely dimension detail drawings of embossing punches. The diemakers only find it necessary to make the punches.



GAUGE	A	B	C	D	E
13	.0937	.075	.050	.180	.065
14	.0781	.075	.050	.180	.065
15	.0703	.075	.045	.172	.055
16	.0625	.060	.045	.172	.050
17	.0562	.055	.040	.156	.045
18	.0500	.050	.040	.156	.040
19	.0437	.050	.040	.125	.035
20	.0375	.050	.035	.125	.035
21	.0344	.050	.030	.125	.030
22	.0312	.060	.030	.125	.030
23	.0281	.050	.025	.109	.025
24	.0250	.050	.025	.109	.025

***Above:* TABLE A. Projection welder: Dimensions—button type.**

***Left:* TABLE B. Projection welder: Dimensions—cone type.**



GAUGE	A	B	C	D	E
6	.2031	.070	.203	.094	.182
7	.1875	.070	.203	.094	.166
8	.1718	.060	.190	.080	.138
9	.1562	.060	.172	.080	.122
10	.1406	.060	.172	.080	.110
11	.1250	.055	.172	.080	.100
12	.1093	.055	.172	.080	.090

BY standardizing these embosses, the product designer's job will not only be simpler, delay and expensive experimenting in the toolroom eliminated, but other advantages will be gained.

In Table A the button type projection is illustrated. It is satisfactory for stock up to 13 gage as indicated in the table. In Table B the cone type is illustrated. This type is used on thicknesses over 13 gage. Too often designers specify the button type in these greater thicknesses, having never even heard of the cone type. The cone type has proved of great value in the heavier gages.

NOTE: On this and the preceding page is the sixteenth of a series of Data Sheets to be published in THE TOOL ENGINEER. A handy three ring binder can be secured at any dime store to hold the sheets for quick reference.

PRODUCTION DATA SHEET

TONS PRESSURE REQUIRED TO PUNCH MILD STEEL PLATE

Shearing Strength of 50,000 Pounds per Square Inch

Tables and drawings by courtesy of THE CINCINNATI SHAPER COMPANY

Thickness of Metal		Hole Diameter						
Gauge	Inches	1/8"	3/16"	1/4"	5/16"	3/8"	7/16"	1/2"
20	.036	.35	.53	.71	.88	1.1	1.2	1.4
18	.048	.47	.71	.94	1.2	1.4	1.7	1.9
16	.060	.59	.89	1.2	1.5	1.8	2.1	2.4
14	.075	.74	1.1	1.5	1.9	2.2	2.6	2.9
12	.105	1.0	1.6	2.1	2.6	3.1	3.6	4.1
11	.120	1.2	1.8	2.4	3.0	3.5	4.1	4.7
10	.135	.....	2.0	2.7	3.3	4.0	4.6	5.3
3/16"	.187	.....	2.8	3.7	4.6	5.5	6.5	7.4
1/4"	.250	.....	.....	4.9	6.2	7.4	8.6	9.8
3/8"	.375	.....	.....	.....	.....	11.1	13.0	14.8
1/2"	.500	.....	.....	.....	.....	.....	17.2	19.7
5/8"	.625	.....	.....	.....	.....	.....	.....	.....
3/4"	.750	.....	.....	.....	.....	.....	.....	.....

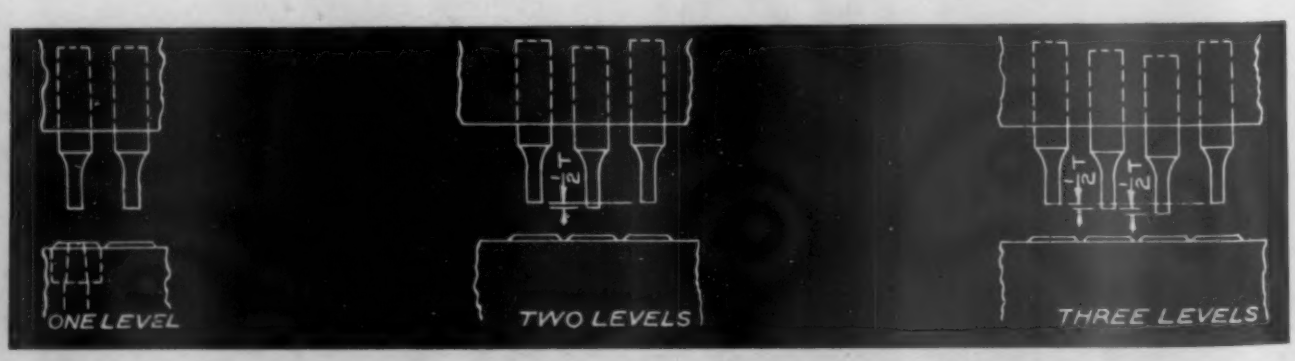
To obtain the total pressure required for one-level punching, multiply the pressure shown by number of holes to be punched.

Resultant tonnage should not exceed approximately two-thirds the rated capacity of brake for smooth operation.

If punches are stepped one-half of the metal thickness or more, the total pressure will be reduced as follows:

Punches on 2 levels, divide by 2.
Punches on 3 levels, divide by 3.
Punches on 4 levels, divide by 4.

Thickness of Metal		Hole Diameter							
Gauge	Inches	9/16"	5/8"	11/16"	3/4"	13/16"	7/8"	15/16"	1"
20	.036	1.6	1.8	1.9	2.1	2.3	2.5	2.7	2.8
18	.048	2.1	2.4	2.6	2.8	3.1	3.3	3.5	3.8
16	.060	2.7	2.9	3.2	3.5	3.8	4.1	4.4	4.7
14	.075	3.3	3.7	4.1	4.4	4.8	5.2	5.5	5.9
12	.105	4.7	5.2	5.7	6.2	6.7	7.2	7.7	8.3
11	.120	5.3	5.9	6.5	7.1	7.7	8.3	8.8	9.4
10	.135	6.0	6.6	7.3	8.0	8.6	9.3	10.0	10.6
3/16"	.187	8.3	9.2	10.2	11.1	12.0	12.9	13.8	14.8
1/4"	.250	11.0	12.3	13.5	14.8	16.0	17.2	18.5	19.7
3/8"	.375	16.6	18.5	20.3	22.1	24.0	25.8	27.7	29.5
1/2"	.500	22.1	24.6	27.1	29.5	32.0	34.4	36.9	39.4
5/8"	.625	.....	30.8	33.8	36.9	40.0	43.0	46.1	49.2
3/4"	.750	.....	.....	.....	44.3	48.0	51.7	55.4	59.0



Women's hands take over

—to release men's hands for fighting

IN scores of war plants, women have replaced men as turret lath operators. Results have been surprisingly good. Of course, wome with a few weeks' training can't be expected to fill the shoes of expe experienced machinists, but for the steady, repetitive turning operatio needed for much of today's war work, women operators are a logic answer to manpower shortages.

Close supervision is necessary and help in chucking and handli heavy parts must be given but because of the extreme accuracy and rugg durability built into modern Warner & Swaseys, maintaining clo tolerances is not a major difficulty.

Plants now using women turret lathe operators (and there are ma of them) find after a few weeks' training, women turret lathe operato are fast and dependable, with scrap losses held remarkably low.

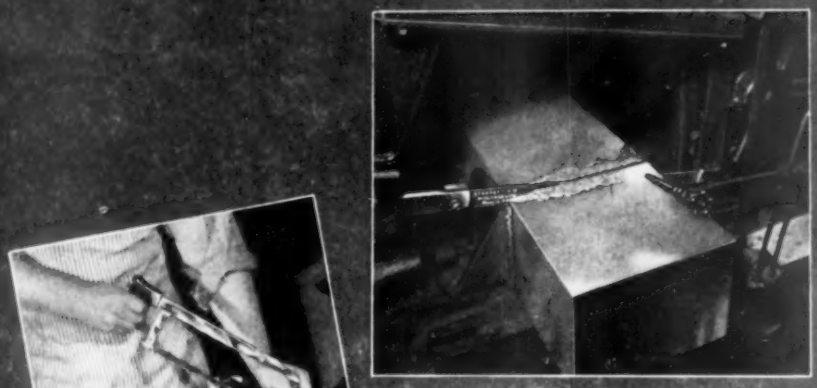
The convenient controls and speed regulators on Warner & Swase minimize manual effort and lessen fatigue.

Thousands of women have been working on Warn & Swaseys in England and Russia. American women c be relied upon to do an equally good job.

WARNER & SWASEY FOR VICTORY

YOU CAN TURN IT BETTER, FASTE FOR LESS... WITH A WARNER & SWASEY

STARRETT HACKSAWS



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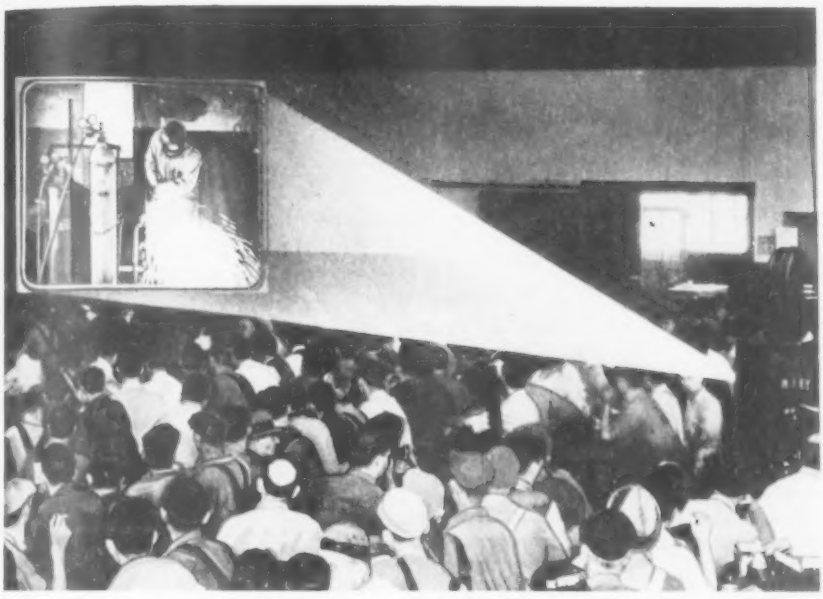
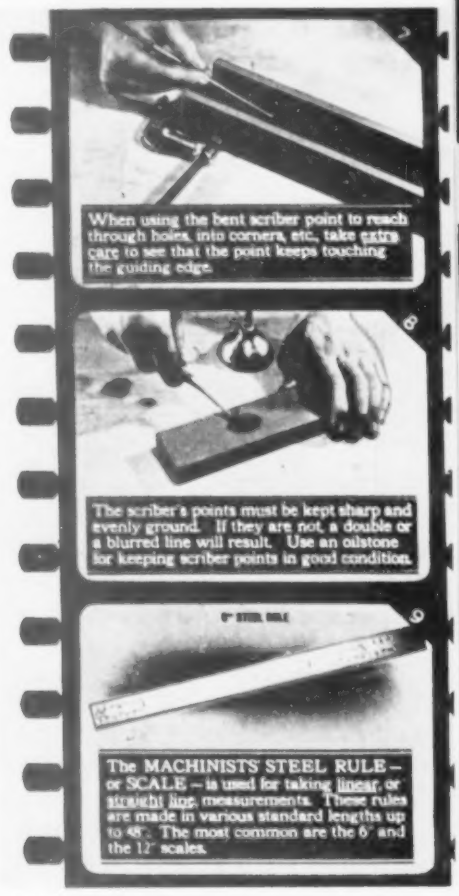
PICTURES *will speed* PRODUCTION



Slide films for instruction of industrial workers can be shown in any semi-darkened room. The picture screen is today playing an important role in training workers in mass production industry.


When using the bent scriber point to reach through holes, into corners, etc., take extra care to see that the point keeps touching the guiding edge.
The scriber's points must be kept sharp and evenly ground. If they are not, a double or a blurred line will result. Use an oilstone for keeping scriber points in good condition.
The MACHINISTS' STEEL RULE — or SCALE, — is used for taking linear, or straight line, measurements. These rules are made in various standard lengths up to 48". The most common are the 6" and the 12" scales.

Each individual picture in a slide film may be projected on the screen indefinitely, and carries an explanation of the operation portrayed. Facts are approved by competent engineers.

IN A WAR in which tools are as important as guns and ammunition, the Nation's call for trained tool users becomes constantly more persistent. At present our reservoir of mechanics is found largely in the vocational classrooms, in the training activities of industry itself.

In this tremendous educational job, so vital to victory, any method that will shorten the period of training in the proper use and care of common bench tools is received with appreciation. It was inevitable that the picture screen, which has proved its value in making complex ideas more quickly understandable, should be adopted in the present emergency.

Today, dozens of leading industrial concerns are utilizing movies and slide films to educate skilled workers in the use of their products. For the new worker, the initiate in industry, the number of educational films is somewhat more limited. The U.S. Office of Education, in conjunction with Castle Films, Inc., has prepared some fifty training films for metal working industries. These pictures, along with others turned out by private industry, will be described in subsequent issues of THE TOOL ENGINEER.

One of the best examples of practical slide films now available for worker training in metal cutting is a series on "Bench Work" produced by the Jam Handy Organization, 2821 East Grand Blvd., Detroit.

Numerous subjects

THERE ARE TEN FILMS in this series, each covering a single tool or type of tool commonly used in metal working industry. Description of these films follows:

1. TOOLS — Use and care of hand tools for bench work.
2. HAND AND POWER HACK-SAWS — Sawing various metals. Selection of feeds and speeds.
3. DRILLS AND DRILLING — Types of drilling. Parts of a drill. Drilling machines, and techniques of drilling.
4. REAMING, TAPPING AND THREADING — Types of reamers, tap and dies, and their parts. Techniques of reaming. Removing broken taps.
5. FINISHING ROUGH CASTINGS — Parts of castings to be removed. Detailed steps in finishing the casting. Tools used.

(Continued on page 102)

(Continued from page 101)

6. SCRAPING — Why scraping is necessary. Tools used, and technique of scraping and checking finished work.
7. RIVETS AND RIVETING — Kinds of rivets. Tools used. Methods of riveting, and causes of failure.
8. LAYOUT TOOLS, AND MEASURING INSTRUMENTS — What layout work is. Tools used. Use and care of measuring instruments.
9. LAYOUT WORK: PART ONE — The importance of accurate layout work. Techniques used in layout work. Basic geometric constructions.
10. LAYOUT WORK: PART TWO — Special layout problems on actual work examples.

•

THIS SLIDEFILM SERIES totals hundreds of individual pictures, including photographs, diagrams, cross-sections, sketches and exhibits. Each individual picture carries printed captions, designed to amplify what the picture shows.

This group of Jam Handy films is one of 18 different series they have produced on as many fields of industrial training. Filmstrips are not intended to fully educate an apprentice tool user but explain the elements of tools, their purposes, use, and care. Because pictures teach faster than words or text-book study, they serve to shorten the period of time the beginner must spend in learning fundamentals.

One series of slide films on Bench Work comprises 10 different subjects, may be carried in this small box. Producer is the Jam Handy Organization, Detroit.

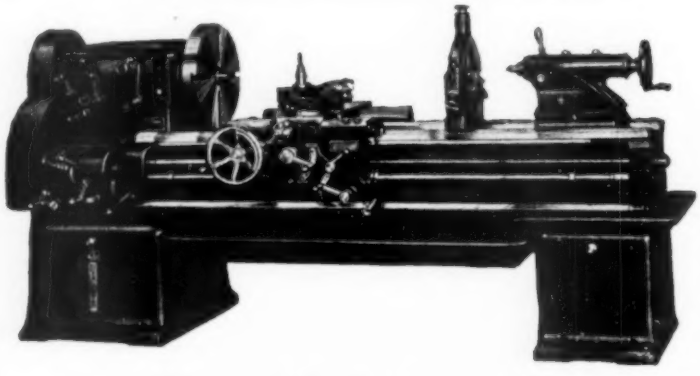
They furnish the vocational instructor with a valuable "pattern" for lecture, talk or discussion during the projection of each subject, usually coupled with practical shop practice and demonstration.

There are definite advantages in using slidefilms as supplementary to vocational shop instruction. For instance, pictures are large and lighted —like a movie, insuring class concentration, and making the pictured facts more interesting. The instructor can set the pace of study to suit himself or to suit the particular conditions of teaching. Films may be stopped at any point for practical demonstration or question and answer sessions. Individual students may refresh their memories by re-projecting the films after class.

A slidefilm (or filmstrip) is a length of standard motion picture film with a picture on each frame or segment, which may be projected on the screen, one at a time in series, in logical order, and in any semi-darkened room. Facts and material are, without exception, checked by competent engineers.

Many industrial plants are today finding pictures of great value in laying the ground work for intensive schooling in the use of bench tools and other shop equipment.

THE END.



The Metalmaster

PICTURE OF PERFECTION

Note These Features of This Bradford Lathe

→ Spindles are manufactured from high carbon molybdenum steel forgings bored from the solid stock straight through from end to end.

→ Spindle rolls on heavy duty precision tapered roller bearings, preloaded in accordance with the best engineering practice and easily adjusted.

→ All gears are high quality alloy steel, heat treated, shaved, and lapped to close tolerances for smooth and quiet operation.

→ Twelve speeds in geometrical ratio and in both forward and reverse are available. Direct reading index plate indicates lever positions for all speeds.

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PRECISION TOOLS SINCE 1840

If no two men have the same sense of touch—

NEITHER HAVE FOUR

6-12 A.M.

Al's touch is tense and not always acute; it's a bit erratic.

12-6 P.M.

George works by "main strength". His touch is not sensitive.

6-12 P.M.

Bill really has a sensitive touch — except when he has a hangover.

12-6 A.M.

Massey is a human gage. But, he works only one out of four shifts.

A typical Dial Indicator Snap Gage which shows the exact variation in size. It does not depend upon the uncertain "feel" of the common fixed type of gage.

but . . . the quality of their inspection should not be influenced by the hours of their shift, their various nervous temperaments, their physical condition, or their general experience. And that will not do today.

Precision inspection of linear dimensions requires uniform, impersonal inspection. Gaging by the sense of touch requires skill without any recourse to magnification. Gaging by sight permits magnification of the error with greater **surety of uniform observation** of the error.

It also makes inspection faster by eliminating the period of doubt while the inspector "feels" the gage as it contacts the work. With a Federal Dial Indicator Gage he **sees** the error clearly and positively. It makes no difference whether the inspector is unskilled or simply tired or whether Bill is inspecting or Massey. A Federal Dial Indicator Gage magnifies the error to where it can be quickly distinguished.

Thousands of designs for faster, more accurate gaging of war material have been made by FEDERAL. Maybe one of them would help you. Why not find out?

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1144 EDDY STREET PROVIDENCE, R. I.

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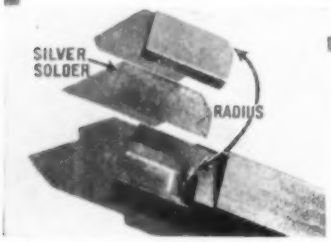
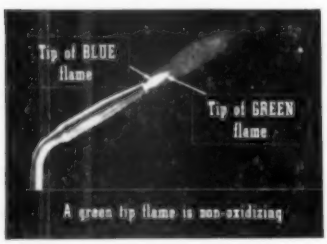
How to Torch-braze Carbide Tips to Shanks and Get Tools on the Job FAST



1 After milling and grinding shank angles, mill recess in shank to fit carbide tips. Cut silver solder sheet (.003 thick) slightly larger than recess. Clean tip, sheet and recess with carbon tetrachloride.

2 Place shank in vise as shown. Apply flux liberally to shank recess and well back of recess. Flux silver solder sheet; place in recess. Flux carbide tip; place in recess. Assembly now ready for brazing.



3 Adjust oxy-acetylene torch to 10 lbs. pressure on both gages, with a tip of green flame and blue flame as shown.

4 Apply torch along bottom. Keep moving. Then work around sides and end of shank. Avoid excessive, or spotty, heating.

To get carbide tools on the job fast, many plants maintain an active stock of standard Carboloy Cemented Carbide tips—ready for brazing to shanks. In this way, carbide tools can be made available for most jobs within an hour after the need arises. Saves weeks—often months—of time—particularly on non-standard, made-to-order type of carbide tools. For this work you need simply an oxy-acetylene torch, and a few brazing accessories including flux, silver solder sheet or rod, etc. Procedure is simple, fast and efficient. Technique quickly acquired, even by inexperienced personnel. Carboloy Training Film available at $3.50 for fast instruction.

☆ ★ ★ ★

Large Standard Tools in Stock for Heavy Work

A range of large size standard tools suitable for heavy cast iron and steel cutting work on boring mills, lathes, etc., are now in stock (1-13-43) available for immediate deliveries. In standard styles Nos. 4 and 7 (right and left hand straight turning) and Nos. 13 and 14 (15° side cutting-edge angle, left and right hand turning). Sizes $1\frac{1}{2}$" square and $1\frac{1}{2}$" x 2". Grade 44A for cast iron; 78B for steel.

Standard-Design Carboloy Tools for Cutting Off to Hollow Cores

Following an analysis of thousands of cut-off tools ordered in the past, standardized designs have been established for tools of this type. These cut-off tools are easy to order, speed up deliveries and eliminate special drawings. Standard-design Carboloy cut-off tools are designed for cutting off to hollow cores, such as on shell forgings, etc. Write for catalog GT-142.

CARBOLOY COMPANY, INC.

Sole makers of the Carboloy brand of cemented carbides

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Philadelphia • Pittsburgh • Seattle

Canadian Distributor: **Canadian General Electric Co., Ltd., Toronto, Canada**

5 When solder melts and shank and tip become dull cherry red, direct flame on the tip. Don't allow solder to become so "watery" that it all runs out from under the tip.

6 Then take a holding rod and move tip back and forth to wipe in joint and distribute silver solder evenly. Make certain that the solder works up around the two enclosed sides of the tip.

7 Now remove flame and press down squarely on tip. Heavy pressure not needed. Hold until silver solder sets.

8 Set tool aside and allow to cool naturally. *Do not quench* in liquids as tip may crack.

CARBOLOY CEMENTED CARBIDES
TRADEMARK

TOOLS • DIES • DRESSERS • CORE BITS • MASONRY DRILLS • WEAR RESISTANT PARTS

A.S.T.E. Meets to Increase War Production

Machine and Tool Exhibition will feature Annual Meeting of Tool Engineers. "Know-how" is theme.

MILWAUKEE, WISCONSIN, booming mid-west war production center, will play host March 25, 26 and 27, to the 1943 Annual Meeting of the American Society of Tool Engineers.

In addition to a lengthy series of technical sessions designed to disseminate knowledge of new techniques in efficient operation of war production tools and equipment, the ele. enth annual Tool Engineering conclave will feature a Machine and Tool Progress Exhibition in which more than 100 builders of equipment will display smaller units and explain the operation and maintenance of all types of machine tools.

Theme of the meeting is "HERE'S HOW TO KNOW HOW." The technical sessions will be educational in character, and are planned to bring to those in attendance the newest ideas in design, personnel training, materials, and conservation of tools and equipment.

Six technical sessions will be presented Thursday evening, March 25; Friday morning, afternoon and evening; and Saturday morning and afternoon. The sessions will be held in the Milwaukee Auditorium, in a hall adjacent to the Exhibition.

Technical Sessions will include symposiums on "WOMEN IN MACHINE SHOPS", "INCREASING TOOL LIFE", and "TOOL SALVAGE". The latter session will present the latest available information. "MACHINING OF NE STEELS", another session, will be presented in such a way that this valuable information will be immediately applicable to war work. The use of glass plug-and-ring-gauges, plastic tools, and induction hardening will be presented in the "TOOL ENGINEERING HORIZONS" session. The "NEW PRODUCTION TECHNICS" session will emphasize the machining of both ferrous and non-ferrous aircraft parts.

The Production Front Edition of the A.S.T.E. Machine and Tool Progress Exhibition will be held in the Mechanics Hall of the Milwaukee Auditorium. Space is available for 144 displays, each 11 feet square. A.S.T.E. Executive Secretary Adrian Potter, who is serving as Exhibit Manager, will supply potential exhibitors with any information. It is anticipated that the exhibition, while lacking much of the heavy machinery customarily displayed, will present photographically and in small displays much of the information and many of the suggestions needed for the successful and efficient operation of war production tools and equipment.

SPOT WELDING TO SPEED AIRCRAFT PRODUCTION

DEVELOPMENT OF METHODS of electric spot welding to eliminate the use of rivets in mass-production airplane manufacture is the objective of a comprehensive research now under way in the laboratories of the University of Southern California's College of Engineering.

The research project is sponsored by the National Advisory Committee for Aeronautics. Welding techniques developed will be available for use by the entire aviation industry.

Maurice Nelles, senior research engineer for Lockheed Aircraft Corp., is collaborating on the project with Dean Robert Vivian of the University's engineering division, and Prof. Sydney F. Duncan.

The possibility of drastically reducing airplane production time lies in the fact that a two-man team can drive about 700 rivets in a work day, while half the manpower can make 50,000 to 60,000 spot-welds in the same time.

One of the problems undertaken in the research is to determine the stability of spot-welded ships; whether this method of construction will stand up in steep dives and quick maneuvers with heavy loads at high speeds.

A specially designed electric spot-welder has been set up in the University's engineering laboratories to study the reaction of various methods of welding on the aluminum alloy used in aircraft manufacture today. Welded points on these sheets, made with various techniques and under various conditions, are subjected to rigid tests. Ends of the sheets are loaded in testing machines, the strain points are recorded photographically, and the stress distribution is computed.

Another phase of the project, which must precede the use of spot welding in mass production, concerns the pattern of weld locations. Long and arduous tests are being carried on to determine whether two welds are twice as strong as one, as well as the most effective design for placing welds.

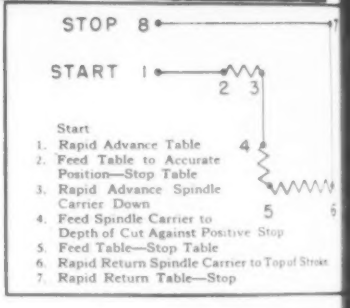
Among the devices used in the experiment is a grid or series of squares drawn on glass, spaced to five-100,000 of an inch. By means of a special camera, the weld specimen is photographed through the squares and enlarged ten times. Laboratory workers use a microcomparator in measuring the stress.

Elimination of rivets in airplane construction will also increase the speed of ships through the reduction of weight and wind resistance, it has been pointed out. A large bomber uses 60,000 rivets.

THE END.

Speed-up of aircraft manufacture through the elimination of riveting is the object of research in welding underway in the laboratories of the University of Southern California. At left is the school's Prof. Sydney F. Duncan with Student John K. Larrimer.

IT TAKES THE OBSTRUCTION JUMPS *Automatically*



The illustration above, with the e planatory cycle diagram, shows a typ example of the type of job handled the CINCINNATI 0-8 Plain Au matic Miller with Automatic Rise a Fall Spindle Carrier.

AN obstruction in the path of a milling cut brings these time-consuming manipulations to mind: Adjust table—raise knee to depth of cut—(mill)—lower knee—rapid traverse table to clear work of cutter. The CINCINNATI 0-8 Plain Automatic Miller, equipped with Automatic Rise and Fall Spindle Carrier, does all these things *automatically; quickly;* far more *accurately* than can be done by hand adjustments of the work to the cutter.

The 0-8 qualifications of closer accuracy and higher production than ever before, fit admirably into the production of the many intricate mechanisms required for both peace-time and war-time equipment. Brief specifications will be found in Sweet's Catalog File. More complete information may be obtained by writing to us for catalog M-964.

CINCINNATI

Industrial News Digest....

A review of significant developments and new techniques in mass production industries.

Ordnance using more steel to conserve aluminum and copper

● More steel for functional parts is the rule in Army Ordnance today, resulting principally in the conservation of aluminum and copper.

Once in full swing, the program is expected to free 180,000,000 pounds of primary aluminum and untotaled quantities of copper and copper alloys, according to the Iron and Steel Institute. Cartridge cases now made of steel already have liberated 591,000,000 pounds of copper. Lieut. Gen. Wm. S. Knudsen, auto production genius, is credited with introducing the now-revolutionary steel shell manufacture.

Heavy Ordnance: Many smaller component parts are now made of steel instead of scarce copper. These include sights, range-finders, fuses, medium and light tank parts, gun fuse setters, components of anti-aircraft and 50-caliber machine gun mounts and carriage parts for guns from 20 to 155 mm.

Pinch-hitting for aluminum: Steel will soon be used in 140 individual parts on medium and light tanks, fins to guide mortar shells, carriages for guns from 20 mm. to 155 mm, components of anti-tank mines, fire control instruments, telescopes, range finders and "windshields" for long-range, high velocity shells.

* *

"Brass hats are safe": As a material conservation step, the Army is scrapping brass buttons for uniforms. Plastic buttons will be the substitute. The change is expected to conserve 365,000 pounds of metal this year.

A.S.A. reviews year's work; new standards set for war production

● **In Reviewing** its 1942 accomplishments, the American Standards Association reports that it has established 73 new standards and revised 49 previously in existence — all of which have tied in closely with the country's war effort.

R. E. Zimmerman, Association president, told members at their annual meeting in December that the ASA "is doing a great many emergency jobs for the War Production Board and the Office of Price Administration."

"A comprehensive program of standards for materials and parts for military radio, is for the first time, unifying the requirements of Army, Navy, prime contractors and sub-contractors," Zimmerman pointed out. "This activity is ironing out a great many kinks in production and in procurement. Companies entering this field doing their tooling on the basis of these new standards." The organization also has started a simplification program for repair parts to insure operation of civilian radios.

In addition to the recent war services for the government, the association earlier made available many of the fruits of its peacetime labor. Available at once for Government purchasing were more than 80 mechanical standards for tools, parts, drawings, bolts, screws, bearings; 70 safety standards for the protection of workers from industrial accidents and electrical standards for motors, wires, insulators and other equipment.

A. S. A. headquarters are at 29 West Thirty-Ninth Street, New York.

New safety program launched; shop not the place for college women

● **With** manpower now the most critical commodity in the war production program, the appalling fact that more American workers were killed last year than fighting men and that at least 52,000 will die without fighting this year provides the National Safety Council's War Production Fund to Conserve Manpower potent ammunition in its program to cut industrial accidents.

Award: Because one-half of the nation's workers still know nothing of safety programs, the Council has inaugerated a dramatic publicity campaign to awaken management and labor to the seriousness of the war production accident rate.

In addition to awards made to plants with high safety records each year, a safety ace will be selected in American industry each week from among those recommended by safety engineers, and the fund will award each a $100 war bond on a national radio program.

Rocky Caruso, worker at the Walter Kidde Co. plant, Belleville, N. J. which makes inflation cylinders for Army and Navy airmen's life rafts, was the first to receive the award.

Caruso's accomplishment: The invention of a device which catches flying metal splinters and muffles loud explosions in a testing operation was this war worker's safety contribution.

* *

Selecting women workers: The Curtiss-Wright Corp. has found that college women are not proficient shop workers, repetitive, routing work is done better by girls of less ability.

Consequently, this concern is using college trained women to alleviate the critical need for technical workers, and is recruiting students for technical training. Curtiss-Wright has contracted with 10 colleges, pays the tuition and living expenses of selected women who are trained on the campus by the college staff in courses designated by the aircraft industry.

"GREENIE"
T.M. REG. U.S. PAT. OFF.
YOU'RE A LOYAL WORKER, GREENIE—BUT OUR BOYS WILL DO THEIR STUFF IF WE PRODUCE IN THE PLANTS AT HOME!
✓HITLER
✓MUSSO
✓HIROHITO
BOMB THE BUMS!

Tools Help Detroit Speed Output

Revealing one of the unusual machine tools Detroit is using to speed war output, Hudson Motor Car Co., proudly points to this three-way multiple drill used in drilling more than 100 holes on three sides of the Hudson Invader marine engine cylinder block.

This machine and a companion which taps the holes, handle more blocks in one hour than were produced in a day when holes were drilled then tapped singly.

Plasticized wood saves aluminum; asbestos replaces vital metals

● Though aluminum output is rising by leaps and bounds, aircraft engineers still find the material so scarce that research continues to find substitutes applicable to mass production. Latest result of this research is the saving through the use of wood plastics of more than 200 pounds of the vital metal on each Consolidated B-24 bomber built at San Diego.

In production: Wing tips, various trimming tabs, side gunners' doors, and map cases are among the parts being constructed of plasticized wood in California. Soon, the aircraft builders say, the nose wheel doors and wheel well domes will be changed to wood.

"After more than two years of research and the development of our own

(Continued on following page)

(Continued from preceding page)

system of impregnating the wood with a resin and baking it we have found that in most cases the wood is lighter and cheaper to fabricate than the metal", Consolidated says.

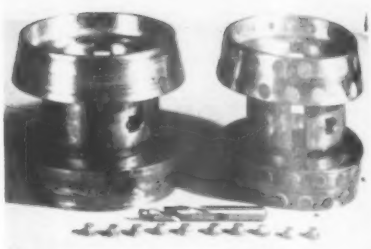
* *

Saving critical metal: A new type of asbestos is replacing metal in numerous mass-produced aircraft fittings, Manufacturer is the United States Rubber Co.

Designed in any shape or form required, the new product is made to withstand continuous heat of 350° F or a temperature as low as 40° below F zero. Such fittings are said to have marked advantages in sound-deadening, and resistance to vibration. Parts made of this material now in production now include carburetor air intakes, heater hose nozzle, defroster attachment, gun blast boot, heat register, turbo cooling fittings, air connector to supercharger and many others.

Westinghouse engineer suggests repair for automatic screw machine clutches

● **When** the clutch body and the friction drive rings of automatic screw machines wear, compensation may be made by an outward adjustment up to 5/32" from the friction the friction backs. But as these friction rings are adjusted out, wear also shows up in the threads, and results in a low friction ring that chatters and grabs in changing from different speeds.



Micarta inserts in friction face of drive ring on automatic screw machines makes a smoother and quieter operating clutch. Less tension is required to drive the spindle.

Remedy: Micarta inserts in the friction face of the clutch body allows the friction rings to be adjusted back into the friction backs, according to J. L. Witchey, Superintendent of the Binocular Department at Westinghouse. In most cases this does away with the looseness in the threads. This repair makes a smoother and quieter operating clutch than the original brass ring, and it has been noted that less tension has been required to drive the spindle. Such repairs at Westinghouse in service two years show no signs of wear, he says.

Output: In reporting its record for the year, Westinghouse points to a total production valued at $500,000,000. This is a 35 percent increase over 1941 output. Employment rose 1,500 monthly, millions of dollars of machine tools were purchased, $165,000,000 was spent on additional facilities.

Curtiss-Wright uses printing presses to transfer patterns to sheets

● **Printing presses,** it is believed, are being used for the first time in making duplicate patterns for the production of airplane parts from sheet metal. Curtiss-Wright Corp., Columbus, Ohio, takes credit for the development.

Time saving: Use of the printing press as a tool in war production, according to Wright engineers, "has slashed man hours and materials involved by 85 per cent" and solved a major production problem.

Impressions of original parts patterns are now transferred speedily to steel sheets for duplicate patterns by comparatively unskilled workmen using printing presses. J. A. Williams, speaking for this builder of Navy scouting and bombing planes, said the new processes at Columbus and in other Curtiss-Wright plants, "is smashing one of the major bottlenecks in the production of airframes."

Assembly line methods speed work at new Ohio River Navy shipyard

● **When** one of the Navy's latest type landing barges for tanks hit the Ohio River at Ambridge, Pa., January 23, the applicability of assembly line methods of manufacture to small ship construction was again proven.

The launching, first in the shipyard, took place exactly nine months from the day construction of the new 64-acre

(Continued on page 112)

●For more than thirty-five years we have been acquiring the SKILL which is now available to help you solve your design and production problems.

Whatever your requirements may be, McKinney engineers, designers and tool makers will combine their ability and experience to give you *results.*

Let McKinney help you gear-up your operations for maximum war-time efficiency! *We invite your inquiries.*

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No. 3A DUOMATIC Performance Features

Fully automatic in operation—especially trained operator unnecessary.

Any combination of straight turning or angular "in" or "out" facing cycles, obtainable front or rear, simultaneously or independently.

Graduated tool slides can be swiveled to any angle, front or rear.

Independent mechanical feed and traverse mechanism—front or rear.

Front and rear cycles quickly changed over to suit the jobs—only simple mechanical adjustments required.

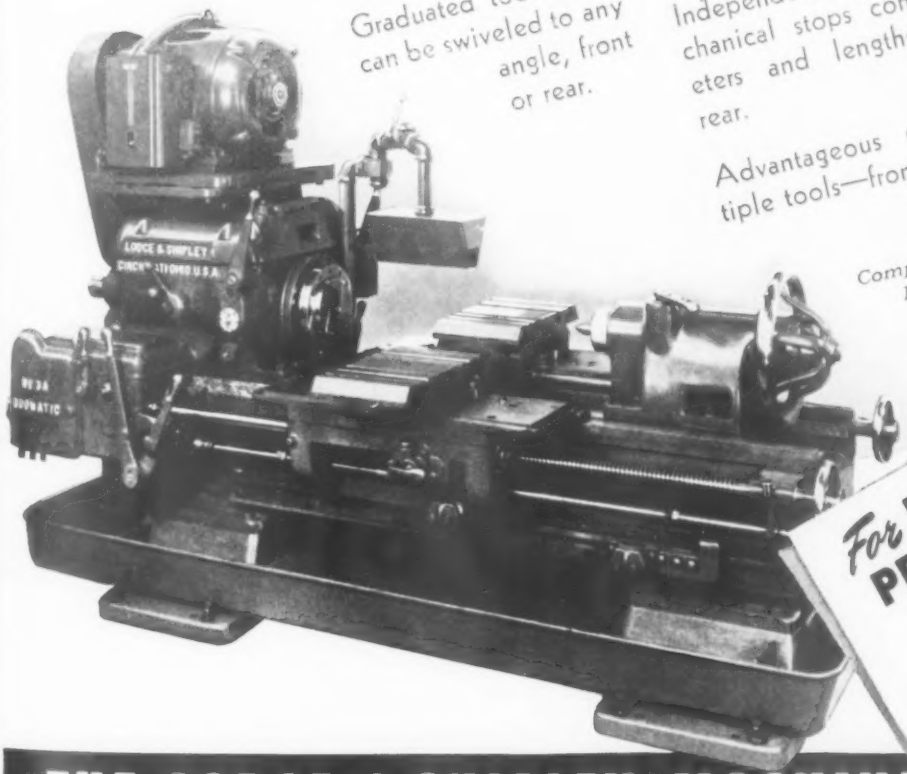
Controls duplicated front and rear.

Independent positive mechanical stops control diameters and lengths, front or rear.

Advantageous use of multiple tools—front and rear.

Proudly worn since March 6, 1942

Write for Comprehensive Booklet No. 601-FL-742



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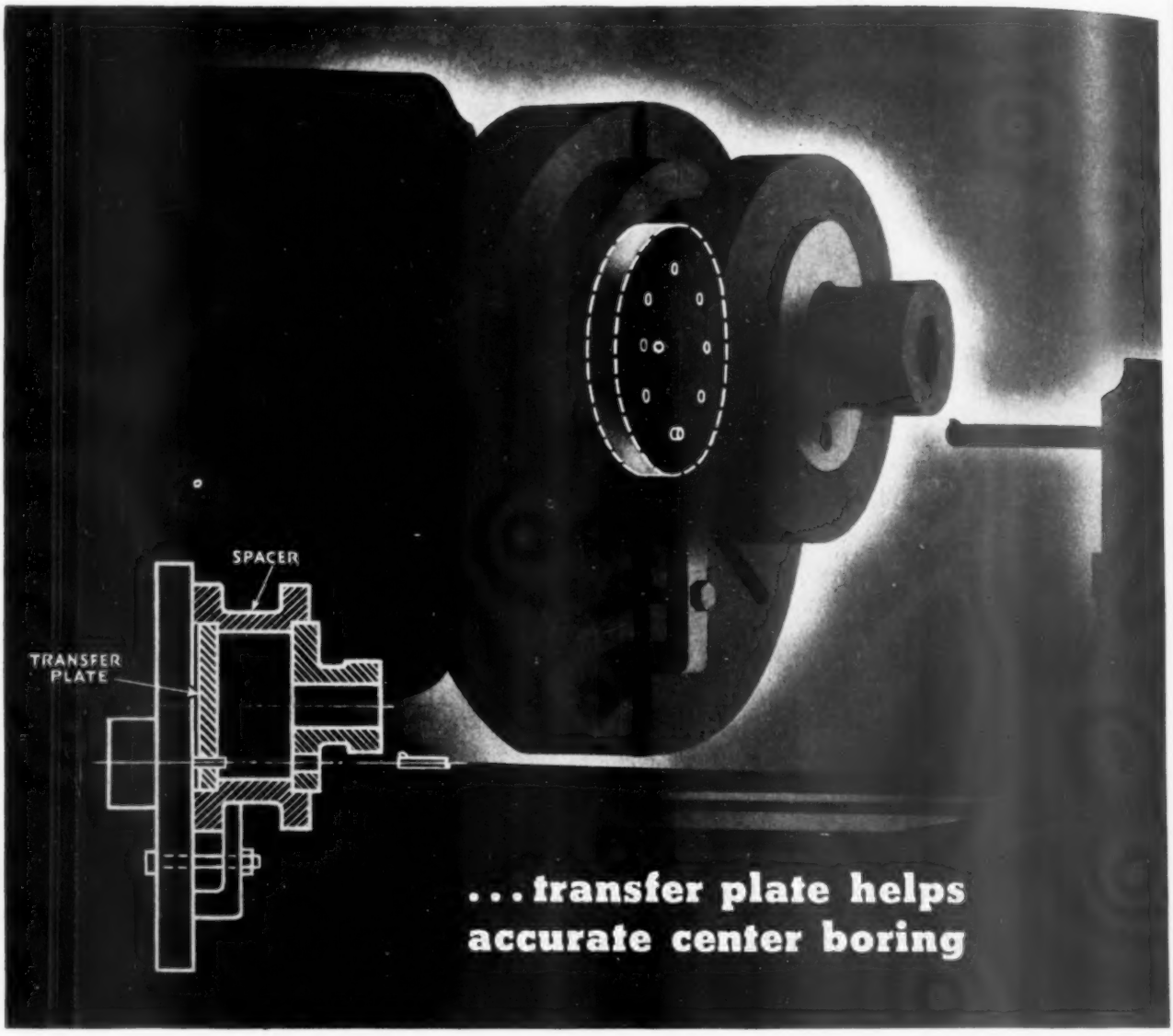
THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI, OHIO, U.S.A

ENGINE TOOL ROOM AUTOMATIC LATHES



Information supplied by an Industrial Publication

The problem of drilling a number of holes in a part on precise center distances is seldom simple. It is particularly complicated in mass production of parts where holes must register accurately.

The answer in one plant is what is known as a transfer plate. This is really a circular template, of any thickness over ⅛ inch, with uniform holes drilled on accurate centers. These holes fit a pin located at the exact center of a lathe face plate.

In mounting, the work is assembled to the transfer plate with a spacer between. The assembly is pinned to the face plate through one of the holes in the transfer plate, and clamped tight.

A boring bar in the lathe tool rest can be used to bore a hole of any desired size in the work. The hole will be exactly in line with the pin, and consequently with the hole in the transfer plate.

Subsequent holes are bored by passing the pin through the remaining holes in the plate, until all are bored. When finished, every hole, regardless of diameter should be on the same center as the corresponding hole in the plate.

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Cone handbooks are useful in helping both new and experienced operators to get excellent results from Cone machines.

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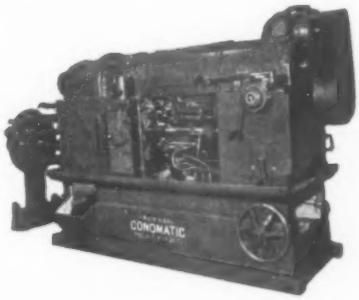
WINDSOR, VERMONT
U. S. A.



(Continued from page 108)

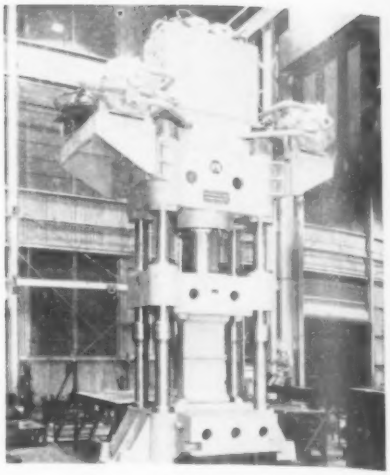
plant was started by the American Bridge Co., U. S. Steel subsidiary. Fabricating facilities of the new yard, built and operated for the Navy, include a building having five and one-half acres under one roof, and is supplemented by shops at the adjoining plant of the American Bridge Co.

Mill shapes and plates are fabricated and pre-assembled in sections in various shops, and flow to the ship berths. A complete outfitting dock is provided at the terminus of the launching ways. Shipbuilding berths are serviced by overhead travelling cranes which facilitate operations. It is believed to be one of the few yards where this type of equipment is in use.

Approximately 3,500 tons of steel, enough to build two modern Navy destroyers, were conserved by the company in developing the new Navy yard. The steel was saved by dismantling inoperative U. S. Steel properties. After thorough inspection and alteration to fit the requirements of newly designed structures at the yard, the material was re-erected to provide modern facilities.

New all-hydraulic forging press demonstrated to trade

● Recently completed in the Mount Gilead, Ohio, shops of The Hydraulic Press Mfg. Co., was an all-hydraulic 1,000-ton H-P-M Fastraverse, self-contained, open forging press.



New 1,000-ton H-P-M Fastraverse, self-contained, open forging press demonstrated at shops of The Hydraulic Press Mfg. Co., Mount Gilead, Ohio, recently.

Typical job: The forging demonstration consisted of working down a hot steel billet, 15 " x 15" x 84" long, between anvil blocks. This billet was forged into a spindle with a minimum diameter of approximately 11". Several small billets, 12" x 12" x 8½" long, were forged into discs approximately 18" in dia. and 4" thick.

Most open forging presses, now installed, are of the steam hydraulic type. This radically new unit requires no boilers, intensifiers, reciprocating pumps, etc.; hence is said to be cheaper to install, operate and maintain. The press has a pressing speed of 105" per minute, a platen 72" x 48" and a bed 72" x 111".

Hydraulic's two Mount Gilead plants are engaged 100 percent in war work.

Perfex Gage & Tool moves into new plant; production facilities improved

● After a month's steady production at their new plant in Detroit, the Perfex Gage & Tool Company announces a marked increase in output of vital war tools.

Facilities: The plant was built expressly for the manufacture of gages and has the latest type of equipment. Included in its 10,000 square feet of floor space are special air conditioned lap and inspection rooms that are kept at a temperature between 68° and 70°;

Elmes Engineering Works joins American Steel Foundries

● The Charles F. Elmes Engineering Works is now a part of the American Steel Foundries. The present Elmes organization will remain intact and will operate as a separate unit, it has been announced.

Plans: Current plans contemplate further improvements in manufacturing facilities for the production of hydraulic presses, pumps, accumulators and special machinery. Charles F.

(Continued on page 114)

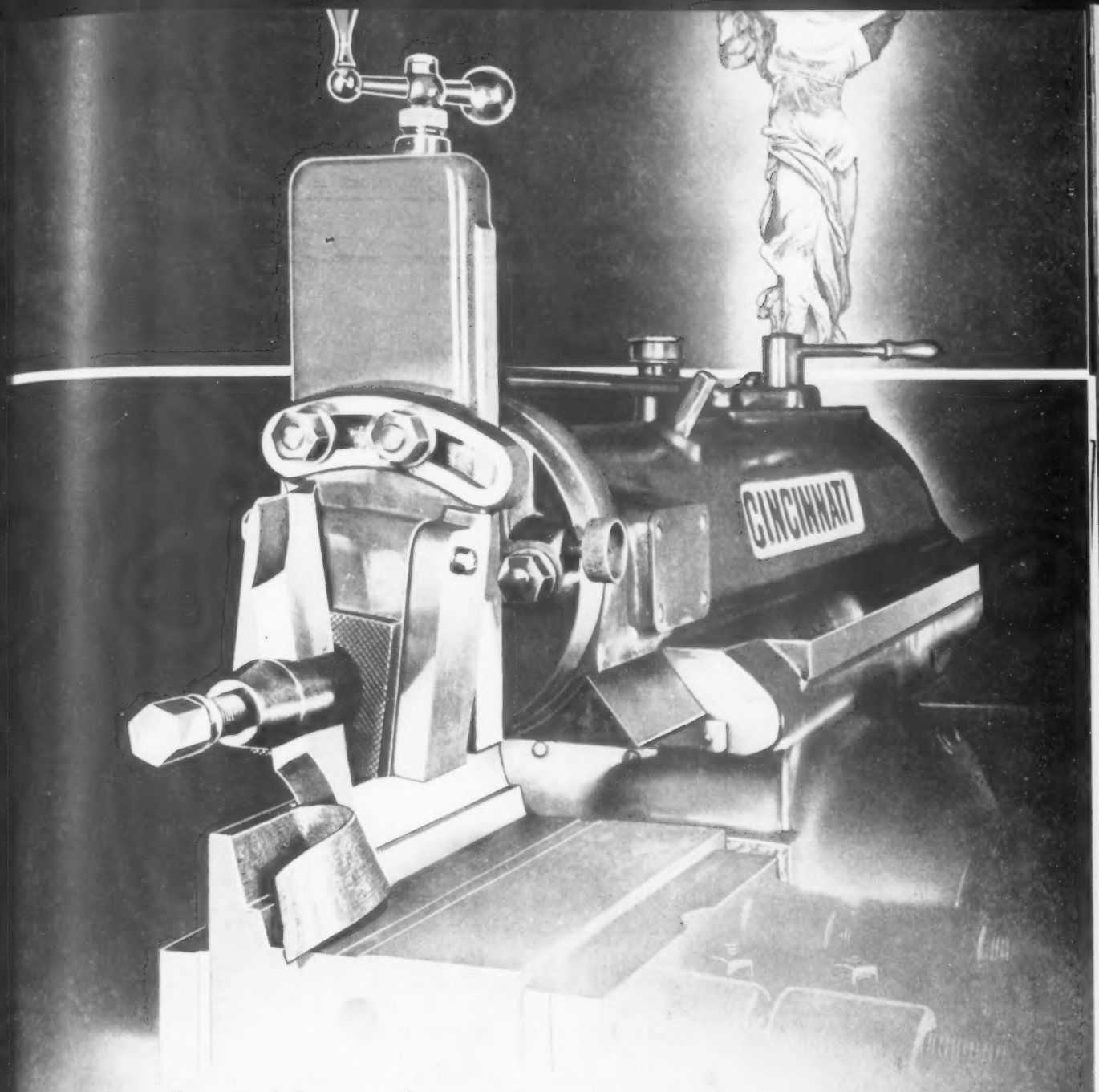
Designed to meet the rigorous requirements of your presses, Muehlhausen Die Springs of the proper sizes and types can assure you finer, faster die work.

Muehlhausen Die Springs are available in Series "S" for high speed; "M" for regular speed; and "HD" for heavy duty presses. Over 200 sizes are stocked, ranging from 1 to 15 inches in length, and exerting pressures from 80 to 3,000 pounds.

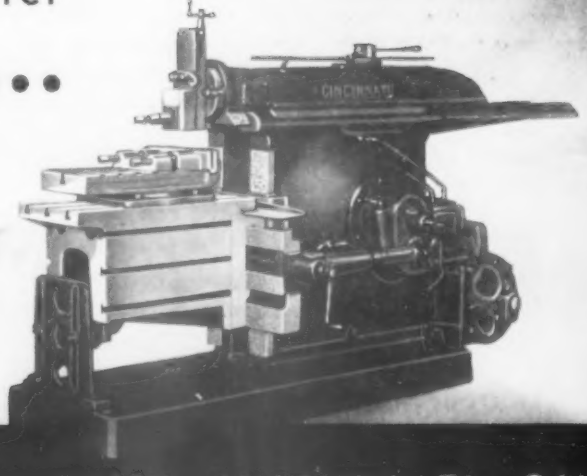
FREE BULLETIN!
New Die Spring Booklet describes 206 sizes and types of die springs.

Muehlhausen Spring Corporation
625 Michigan Ave., Logansport, Ind.
Send New Die Spring Booklet, Free.
Name _____
Address _____
City _____ State _____

MUEHLHAUSEN SPRINGS
EVERY TYPE AND SIZE



Powerful • • • Accurate • • •
Cincinnati Shapers offer
record performance • • •



THE CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO

(Continued from page 112)

Elmes will remain as general manager of the new firm in the same Chicago location.

"Tailoring Shops" speed aircraft output; radio used in riveting

● **Moving** off mass production assembly lines without halts for special touches, warplanes are now being "tailored" for specific tasks somewhere between the factory and the battlefront.

Net result is a speedup of assembly line operation, as the plane does not have to wait at the factory for the installation of highly intricate and sometimes secret weapons and instruments.

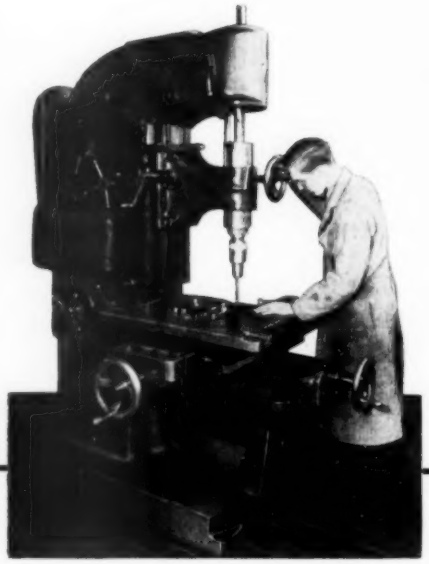
Thus, additions or subtractions to fit the planes for specific types of combat are handled at modification centers rather than slowing the production job for any necessary retooling.

* *

The National Broadcasting Co. has announced that radio has been applied to riveting in the manufacture of military aircraft.

"Rivets previously hard to reach with the regular machines now are fastened by a form of radio. In this particular application of the high-frequency radio wave, heat is generated which detonates a high explosive charge in the end of the rivet. The explosion expands the charged end of the rivet, setting it securely."

THIS WAR-WORKER HAS A FOUR-FISTED MACHINE



1. Rigidity
2. Accuracy
3. Speed
4. Power

THE KNIGHT MILLER

In the illustration the machine is drilling holes in a large die plate prior to boring. No preliminary layout is necessary because a dial indicator is used to locate holes.

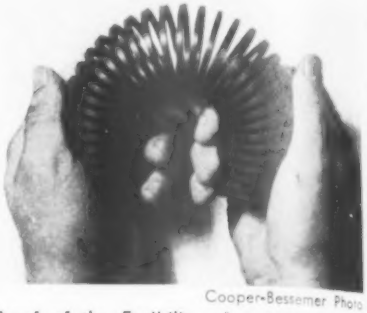
● RIGIDITY, ACCURACY, SPEED, and POWER — all are assured with this universal vertical Knight milling machine. It produces more work, requires less equipment, eliminates hours of layout, and produces quality results. Such features make the Knight Miller a time-saver and a profit-maker.

The construction of the unique table unit, which swivels around the column and tilts either side of horizontal, is just one feature which makes this machine so outstandingly versatile. Without special equipment it can quickly and accurately machine difficult and unusual parts. Write today for complete information on this versatile miller.

W. B. KNIGHT MACHINERY CO.
3920 WEST PINE
SAINT LOUIS, MO.

36 Years A Builder of Quality Milling Machines

Meehanite Cast Iron proves successful in diesel engine crankshafts



Cooper-Bessemer Photo

Proof of the flexibility of cast iron is this spring cut from a cylindrical casting of Meehanite Metal.

● **The** Cooper-Bessemer Corporation, manufacturers of diesel engines and air compressors, have been supplementing forged steel with Meehanite cast iron in making diesel engine crankshafts.

The company has had Meehanite cast iron crankshafts in actual service for six years.

The satisfactory production of the castings has resulted in part from years of work with Meehanite Metal in diesel engine manufacture. Since 1935, Cooper-Bessemer has been making all its engine castings from this metal. It shows a more uniform hardness throughout than either gray iron or alloy iron; is free from such defects as spongy regions, porosity, shrink cracks, internal strains or crystal weakness, and castings made from it are susceptible to heat treatment in much the same way as steel, engineers report.

Ordnance Department now using glass gages; many advantages claimed

● **Long produced** exclusively of alloy steel, precision gages made from glass are today a reality. Glass gages are now out of the experimental stage, and Ordnance is using them on inspection at Frankford Arsenal.

Fact that the Ordnance Department was experimenting with glass gages was first revealed by The Tool Engineer, in reporting a talk delivered last October by Col. H. B. Hambleton, Office of Chief of Ordnance.

Advantages: reports from Frankford indicate that the use of glass in gages is more than a temporary expedient to alleviate the alloy steel shortage. As glass gages don't rust, inspectors do not have to wipe their hands before using them. Because they are translucent, they permit greater speed and accuracy in many out-of-the-way inspections. Since their normal thermal conductivity is less than that of steel, and their linear coefficient of thermal expansion (0.0000040 to 0.0000060 per degree F.) no greater, heat from the inspector's hands will not affect its accuracy to such an extent. Finally, glass gages are lighter and easier to handle, it is said.

These gages are being made in four types: plug gages (go and no go) from ¼-inch up; ring gages; snap gages; and profile and position gages. Wood or plastic frames protect ring, snap and profile gages against breakage.

(Concluded on page 116)

EVERY TOOL STEEL HAS AN ALTERNATE

. . it pays to know them

As war production rises rapidly toward its peak, the problem of *materials* becomes more and more insistent.

High Speed Steels furnish one of the best examples, because these special steels depend for their properties on some of the most critical alloying elements in the list. Continuity of supply of High Speed Steel is absolutely essential to continuity of production; yet, under the exigencies of equable distribution, you may encounter a temporary shortness of supply in your first-choice cutting steels at any given time.

It would be wise to protect yourself against such an eventuality. Take precautions against a loss of production time and volume by learning the *alternate* tool steels for your jobs. Get familiar with them —just what they'll do and how they're handled. Frequently the alternate can step into the job with no loss of performance; in a great many cases, a steel can be found that will out-perform the original.

• Play safe—know the alternate tool steels for the types you customarily use—let our engineers help you.

ADDRESS DEPT. TE

AL

STEEL FOR THE NATION'S WELFARE

Allegheny Ludlum

STEEL CORPORATION

GENERAL OFFICES: BRACKENRIDGE, PENNA.

A-8608 W&T

(Concluded from page 114)

Savings: Glass gages are molded with such precision that they require little grinding and lapping to bring them to final dimensions. They require no lathe work. It is estimated that they can be made with only one fourth of the machine tool and man hours consumed in the manufacture of steel gages. Once the gage molds are made, the cost of finished glass gages is about half that of steel. Breakage has been found unusually low.

Corning Glass Works and A. H. Heisey & Co., are the only concerns currently making glass gages. It is planned that glass blanks be finished into precision gages by gage manufacturers. THE END.

Notables Attend Detroit Broach Company "E" Award

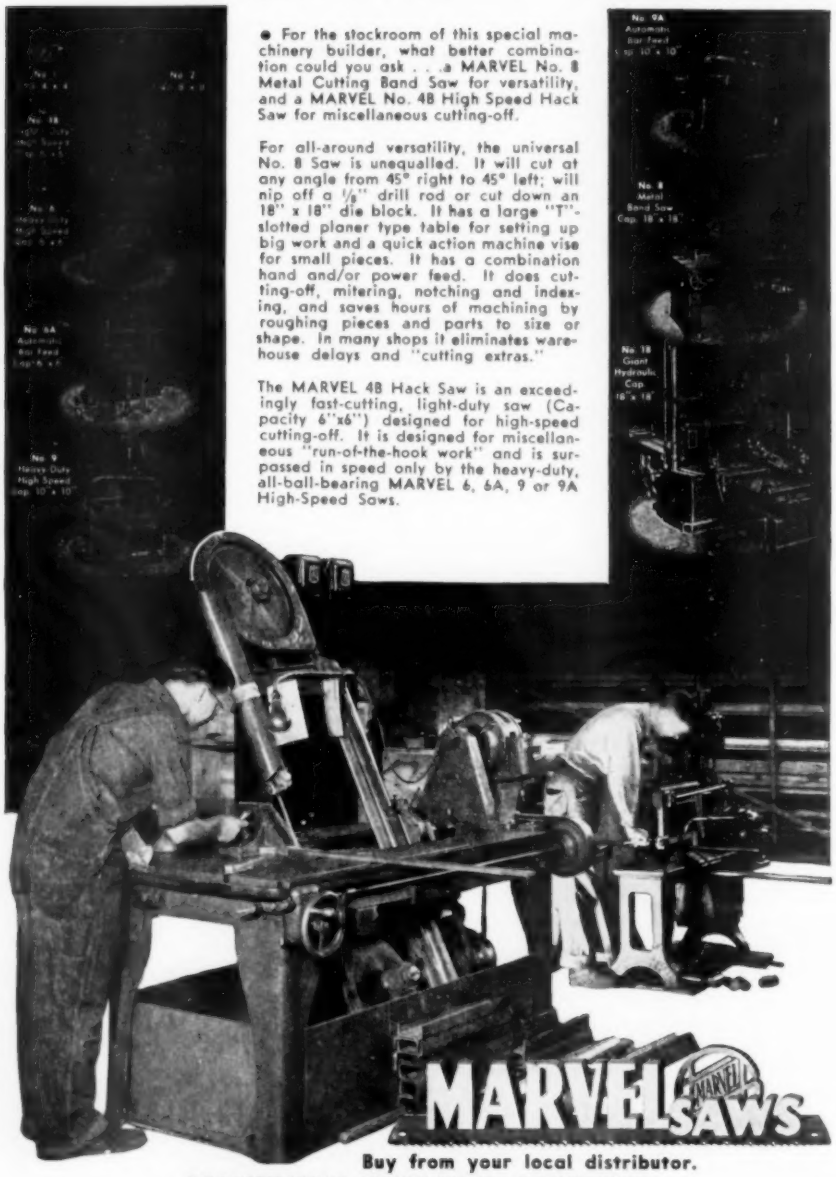
Company employees, officers and national notables attended Detroit Broach Company "E" Award ceremonies January 19. June Shaw and R. M. Williams represented the employees. Gustav von Reis represented the company.

★

ARMY - NAVY "E" AWARD WINNERS

ACME PATTERN & TUBE CO., INC.
Dayton, Ohio
ARO EQUIPMENT CORP.
Bryan, Ohio
BARNES-GIBSON-RAYMOND DIVISION,
Associated Spring Corp.
Detroit, Michigan
CADILLAC MOTOR CAR DIVISION,
General Motors Corp.
Detroit, Michigan
CHICAGO PNEUMATIC TOOL CO.
Cleveland, Ohio
CLEEREMAN MACHINE TOOL CO.
Green Bay, Wisconsin
DAMASCUS STEEL PRODUCTS CORP.
Rockford, Illinois
DELTA MANUFACTURING CO.
Milwaukee, Wisconsin
FAIRCHILD ENGINE & AIRPLANE CORP.
Airplane Division,
Hagerstown, Maryland
THE FELTERS COMPANY, INC.
Millbury, Massachusetts
FIDELITY MACHINE CO.
Philadelphia, Pennsylvania
FLEETWINGS, INC. PLANT NO. 1
Bristol, Pennsylvania
HERCULES MOTORS CORP.
Canton, Ohio
HUDSON MOTOR CAR CO.,
Airplane Division, Main Plant,
Detroit, Michigan
HYATT BEARINGS DIVISION,
General Motors Corp.
Harrison, New Jersey
INTERNATIONAL HARVESTER CO.
St. Paul, Minnesota
ILLINOIS TOOL WORKS,
Chicago, Illinois
JOHNSON MOTORS
Waukegan, Illinois
KELSEY-HAYES WHEEL CO.
Jackson and Detroit, Michigan
KOPPERS CO.
American Hammered Piston Ring Division
Baltimore, Maryland
MATHEWS CONVEYOR CO.
Ellwood City, Pennsylvania
McDONALD MANUFACTURING CO.
Los Angeles, California
J. MERGENTHALER & SON
New York, New York
OHIO STEEL FOUNDRY CO.
Lima, Ohio
THE PIPE MACHINERY CO.
Cleveland, Ohio
SERVEL, INC.
Evansville, Indiana
SIMONDS SAW & STEEL CO.
Fitchburg, Massachusetts
TOOLS & GAGES, INC.
Cleveland, Ohio
TRIANGLE PACKAGE MACHINERY CO.
Chicago, Ill.
UNITCAST CORP.,
Plant No. 1, Steel Castings Division,
Toledo, Ohio
UNITED STATES AUTOMATIC CORP.
Amherst, Ohio
VERMONT TAP & DIE CORP.
Lyndonville, Vermont
VICTOR EQUIPMENT CO.
San Francisco, California
VINCO CORP.
Detroit, Michigan

"Versatility" and "Speed" Characterize *these two* MARVEL SAWS



● For the stockroom of this special machinery builder, what better combination could you ask . . . a MARVEL No. 8 Metal Cutting Band Saw for versatility, and a MARVEL No. 4B High Speed Hack Saw for miscellaneous cutting-off.

For all-around versatility, the universal No. 8 Saw is unequalled. It will cut at any angle from 45° right to 45° left; will nip off a ⅛" drill rod or cut down an 18" x 18" die block. It has a large "T"-slotted planer type table for setting up big work and a quick action machine vise for small pieces. It has a combination hand and/or power feed. It does cutting-off, mitering, notching and indexing, and saves hours of machining by roughing pieces and parts to size or shape. In many shops it eliminates warehouse delays and "cutting extras."

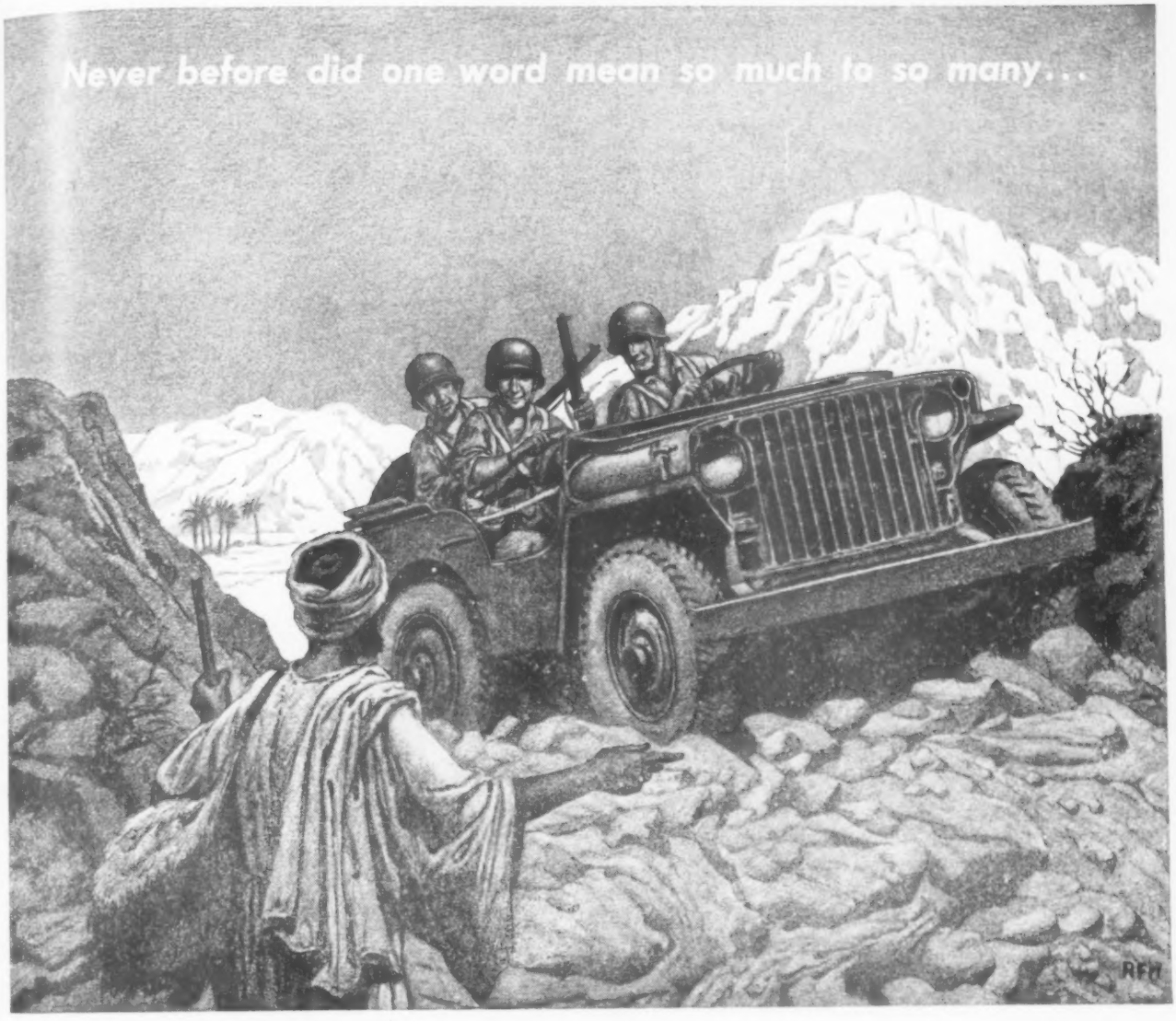
The MARVEL 4B Hack Saw is an exceedingly fast-cutting, light-duty saw (Capacity 6"x6") designed for high-speed cutting-off. It is designed for miscellaneous "run-of-the-hook work" and is surpassed in speed only by the heavy-duty, all-ball-bearing MARVEL 6, 6A, 9 or 9A High-Speed Saws.

Buy from your local distributor.

ARMSTRONG-BLUM MFG. COMPANY

5700 Bloomingdale Ave. *"The Hack Saw People"* Chicago, U. S. A.

Eastern Sales: 225 Lafayette St., New York



You can serve by CONSERVING

Name a continent . . . and you've named an American battlefront. From Tunisia to Timor, from India to Iceland, Americans and their Allies face a need for more arms and equipment . . . more tanks and trucks, more planes and ships and guns.

And those modern weapons need alloy steels in vital parts. Nickel steels, for example, that provide extra toughness, strength and added resistance to shock and impact. No need to tell you how essential these qualities are to the equipment of our armed forces.

That's why it's so important to *conserve* critical alloys. Every possible pound must be saved for our fighting men.

The best way to help is by making sure all metal scrap in your plant is properly segregated. Collect ferrous and non-ferrous scrap, in separate containers, at the machines where generated.

High-speed tool steels and alloyed constructional steels should also be collected and salvaged separately. When in doubt . . . segregate!

If metal problems are bothering you—if you would like suggestions for extending your own metal conservation program—call on our technical staff for "CONSERVICE,"—a new name for counsel and data that will help you conserve.

* * **Nickel** * *

THE INTERNATIONAL NICKEL COMPANY, INC.

67 WALL STREET
NEW YORK, N. Y.

PRODUCTION PIX

☆

WHAT'S DOING IN THE WORLD OF MASS MANUFACTURING

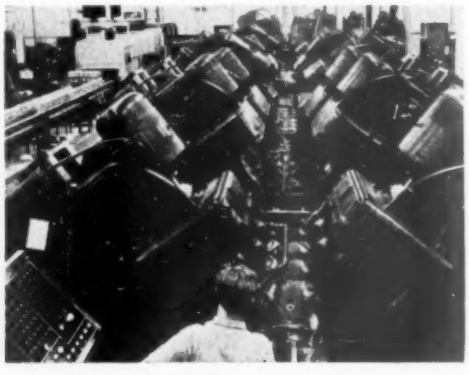
Jackie Maull, once a model for John Powers in New York, is now working in the engineering department of the North American Aviation plant at Inglewood, Cal.

•

Moline (Ill.) Tool Company blacksmith, William Pascoe, may well be the oldest man working daily in American war production. Ninety years old, Pascoe was born in Trewennack, England, where he learned his trade.

A 12-foot planer which was exhibited at the World's Columbian Exhibition at Chicago in 1893 is helping to turn out propulsion equipment for combat and cargo ships. It was rebuilt by General Electric at one of its New England plants at a cost of $25,000 and is said to equal the performance of a new, $125,000 machine.

The first production photo released of the 24-ton Navy "Mariner" patrol bombers shows them on the final assembly line at the Glenn L. Martin Company plant in Baltimore.



Special Greenlee machine at Studebaker Corp. It is more than 175 feet long, has 50 operating stations, handles 130 aircraft cylinder heads simultaneously. Its 162 tools include 36 drills, 35 reamers, 15 mills, 30 taps and 46 special tools.

Precision-finished crankshafts for 300-horsepower radial aircraft engines on a long roller conveyor line at The Aviation Corporation's Lycoming Division war production plant in Pennsylvania.

Attention Gage Users

IMMEDIATE DELIVERY

CLASS OF SERVICE DESIRED			
DOMESTIC		CABLE	
TELEGRAM		FULL RATE	
DAY LETTER		DEFERRED	
NIGHT MESSAGE		NIGHT LETTER	
NIGHT LETTER		WEEK END LETTER	

Patrons should check class of service desired; otherwise message will be transmitted as a full-rate communication.

1206 A

WESTERN UNION

NEWCOMB CARLTON, PRESIDENT — J. C. WILLEVER, FIRST VICE-PRESIDENT

CHECK
ACCT'G INFMN.
TIME FILED

Send the following message, subject to the terms on back hereof, which are hereby agreed to

TO ALL GAGE USERS
YOU ARE OFFERED IMMEDIATE DELIVERY
FROM COMPLETE STOCK ALL MODELS ALL
SIZES AGD ADJUSTABLE SNAP GAGES
STOP ORDERS SHIPPED WITHIN 24 HOURS
THE SHEFFIELD CORPORATION

WESTERN UNION MESSENGERS ARE AVAILABLE FOR THE DELIVERY OF NOTES AND PACKAGES

HOW TO ORDER

State Frame Model and Frame Size. Stipulate whether gage is to be set and sealed. Give complete marking instructions if set and sealed.

FOR SPECIFICATIONS
SEE SHEFFIELD HANDBOOK No. 42-2
PAGES 150-153

THE SHEFFIELD CORPORATION

SHEFFIELD GAGES

CAPITAL COMMUNIQUÉ

T.M. REG. U.S. PAT. OFF.

Peak in production capacity will soon be reached. Plans for increasing efficiency. Proper scheduling is problem. Disappearance of post-war machine tool market is held groundless.

JAY A. BONWIT

Washington Correspondent for
THE TOOL ENGINEER

MAJOR PRODUCTION bottlenecks currently are finishing facilities for components, and manpower.

Of the two, manpower is fast looming as the top problem. In components, War Production Board officials maintain that proper scheduling of output will prevent dangerous interference with programs.

The War Production Board is currently devising means of increasing efficiency of production. Outlook is that as far as facilities are concerned, the peak in capacity will soon be reached. By conservation practices, reduction in spoilage, it is believed that production rate can be maintained despite green labor.

Proper scheduling is a management function at direction of the WPB. Difficulty is that Government officials have not crystallized plans for scheduling by industry.

However, WPB Vice Chairman Charles E. Wilson is approaching the problem realistically, and an early clarification is expected. Questions are being settled by directives issued by WPB Chairman Donald M. Nelson, and through comprehensive agreements with the armed services.

Manpower shortages, on the other hand, are not as easily solved. Manning tables operated in conjunction with replacement schedules to provide for "orderly" replacement of labor lost to Selective Service will ease the problem somewhat.

The crux of the problem is that the steps toward coordination have only recently been taken, and are as yet in the early stage.

Outlook is for an effective over-all scheduling plan to operate efficiently within several months. Manpower shortage — with problems of turnover and absenteeism — will become more troublesome.

Controversial issue is the status of machine tool output. With facilities expansion being levelled off, requirements for machine tools are becoming less urgent, and it has been forecast that within six months machine tool builders will be actively soliciting business.

However, the supply problem will remain acute insofar as certain critical tools are concerned, and it is the opinion of WPB officials that for the duration of the war, demands for all tools will continue at high levels. At the same time, fears for post-war disappearance of market are considered groundless by some Washington observers, who maintain that demand for special tools, and foreign requirements will stimulate demands.

* * *

Critical Tool Service of the Smaller War Plants Corporation reports considerable increase in the critical tool hours which are being made available to WPB and the Army and Navy Muni-

(Concluded on page 122)

These units are precision-built—all made of Meehanite iron recognized for its dense, uniform grain structure and its unusual wear-resisting quality.
This assures a smooth, flawless surface that increases efficiency of your inspection.
The surface plate has scientifically designed ribs to give absolute rigidity and strength to entire surface.
Send for folder
Surface Plates Angles and Cubes
MACHINE PRODUCTS CORPORATION
6775 EAST McNICHOLS ROAD • DETROIT, MICHIGAN

±.0005"? OK Mister, you came to the right place!

GISHOLT

Gisholts are precision built to produce within close limit
f accuracy—and to stay accurate.

GISHOLT MACHINE COMPANY, East Washington St., Madison, Wis.

LOOK AHEAD...KEEP AHEAD...WITH GISHOLT IMPROVEMENTS IN METAL TURNING

(Concluded from page 120)

tions Board for placement of contracts.

Reason cited for the increase is the large number of plants which are now cooperating in the program by reporting idle tool time. Plants have been reporting idle time to the regional WPB offices, and these reports are compiled and routed to Washington, where they are made available to the WPB, and armed forces.

Contracts have been placed in more than 6,000 plants, with between 150 to 250 jobs being let weekly to plants with idle time. Many of these jobs have gone into smaller plants.

Plants with idle time can report to the WPB regional offices, and prime contractors requiring critical tool time can apply to these offices.

* * *

To cover cases where delivery of outstanding contracts is cut, the WPB, Army and Navy issued a joint statement of policy calling for instruction to the prime contractor to effect no more than the same percentage of reduction in the schedules of his subcontractors as was ordered in the prime contracts.

Where readjustments are deemed necessary in existing programs, it is the policy of the armed services to give particular attention to a continuance of operation in those facilities employing the minimum amount of materials and the minimum number of man-hours to complete like components and like end-items. The law covering small war plants is, of course, operative in such cases.

Where existing facilities are adequate to meet the demands of the revised programs of production, it is the policy of the armed services and the WPB to defer completion of additional facilities, including tools, jigs and fixtures, until after complete study is given to each case.

* * *

Actions of significance to the industry:

December 23 — Steel supply reported by WPB Chairman Nelson to be sufficient to meet war and essential civilian requirements. However, that there will not be enough to divert supply for non-essential civilian manufacturers.

December 24 — WPB issued Order L-234, bringing under control production and deliveries of industrial type instruments.

December 29 — OPA issued Amendment No. 22 to Revised Price Schedule No. 67 (New Machine Tools), clarifying that dealers in new machine tools may apply to their own sales any specific price adjustments that have been made to manufacturer's ceiling prices.

December 30 — General Preference Order E-1-b amended eliminating effectiveness of preference ratings on delivery schedules for the machine tool production quota allotted to Service Purchasers, with delivery schedules made subject to the urgency standing of the Service Purchaser. Service Purchasers not included on the Numerical Master Preference List will receive deliveries according to the date upon which the producer receives the photostatic or certified copy of the preference rating assignment. In cases where a Service Purchaser not included on the list is a subcontrator of a listed prime, the subcontractor's order assumes the urgency of the prime's listing.

December 31 — All reference to preference ratings is eliminated from the magnesium allocation order (M-2-b) in a simplification of the WPB order.

January 7 — Controlled Materials Plan Regulation No. 2 issued, governing inventory restrictions under CMP. Objective is to hold inventories of aluminum, copper and steel to a maximum of 60 days' forward requirements.

January 7 — Amendment to General Preference Order M-18-b issued, providing that consumers of primary chromium are no longer required to file Form PD-54 with suppliers, but only with the WPB.

January 15 — Conservation Order L-221 amended to provide that purchase orders for electric motors and generators will not be accepted by manufacturers or dealers unless they bear preference ratings of AA-5 or higher.

January 15 — CMP Division announced that only those manufacturers meeting the time schedule of CMP — February 9 — in return of application blanks will benefit by direct allotments of materials during the second quarter.

January 15 — WPB announced establishment of a resistance welding equipment clearing house.

THE END.

LET OUR
Industrial Engineers
SOLVE YOUR PROBLEMS!

Plant Conversion
Increasing Production
Cost Estimates

Designing Jigs, Tools, Fixtures, Gages, Dies, and Special Machines

Process Engineering

Consultants in Plastics and Tooling

•

WHEN contracts for war work give rise to production problems that demand quick solution, you can save valuable time by turning the problems over to our staff of technicians versed in all phases of industrial engineering.

With a wide experience in serving leading manufacturers in the war industry, our organization can assist you not only in expediting production but also in lowering production costs.

•

WRITE US!

Outline briefly the nature of your production problem and you will hear from us promptly.

ADECO *American* ADECO
Designing & Engineering Co.
1209 WASHINGTON BOULEVARD DETROIT.. MICHIGAN

Speed Control Convenience WITHOUT LIMITATIONS

RELIANCE V*S DRIVE

AN ALL-ELECTRIC ADJUSTABLE-SPEED DRIVE FOR A-C. CIRCUITS

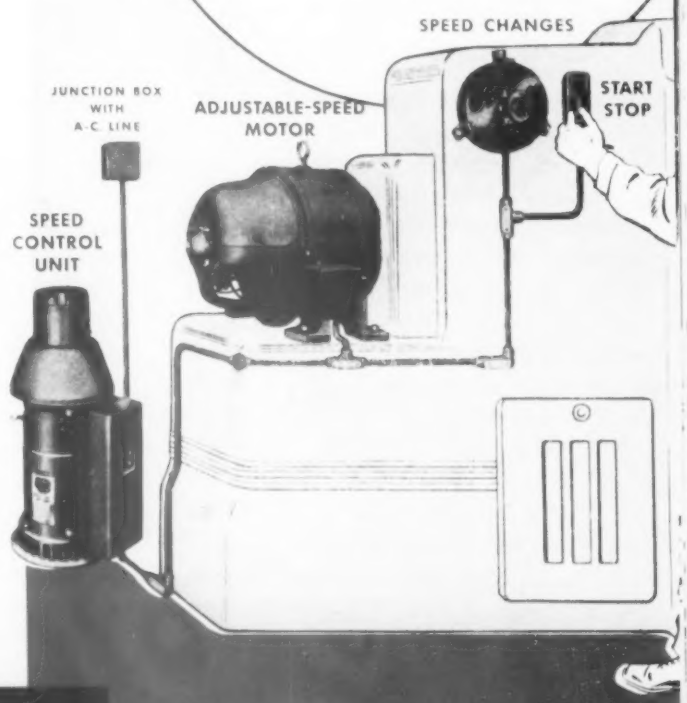
Speed Ranges up to 16 to 1—Sizes 1 to 30 hp.

● These control elements make starting and stopping as easy as ringing a door bell; speed changing as simple as tuning your radio. *Mount them wherever you can run a wire.*

PICK THE SPOT where speed changing will be done most handily and *when needed.* You can put the speed changer for the Reliance V*S Drive right there, and the *start-stop* station alongside. There are no limitations whether machines are long or short, high or low, wide or narrow. Speed changer and *start-stop* station can be at any distance from the motor or speed-control unit. Put them any place that you can run a wire.

PRODUCTION AIDS

Other features which help boost production are: quick stopping, reversing, safe speeds for threading and inching, ample starting torque with controlled acceleration, and speed setting. *Get Bulletin 310 for details.*



RELIANCE ELECTRIC & ENGINEERING COMPANY

1008 Ivanhoe Road • • • Cleveland, Ohio

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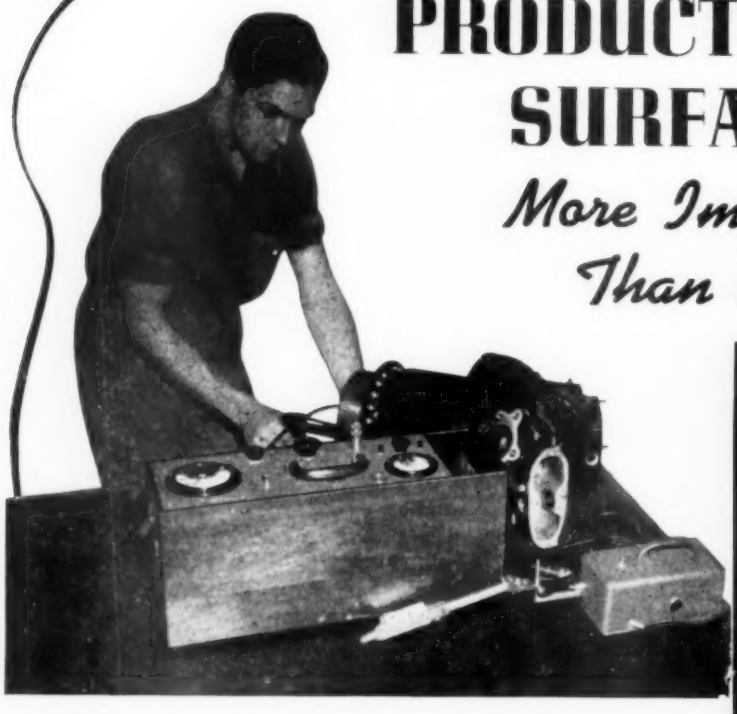
RELIANCE A-C D-C MOTORS

THE DIRECT WAY

Speed-changing devices, clutches, gear trains, e[tc.] plicity of handles and knobs disappear when apply this wide-range adjustable-speed dri-

PRODUCTION CHECK OF SURFACE FINISH

More Important Today Than Ever Before



Profilometers*...Proven In Automotive Production ... Now In Use Throughout All Mass Production Industries

With special emphasis being placed on precision finishes for millions of parts being turned out in War Production, "Profilometer Readings" have become vitally important. They provide the quick, accurate check of surface roughness so necessary wherever specified finishes are being secured.

One instrument only gives "Profilometer Readings" directly—that is the Profilometer. By simply moving a tracer—either manually or automatically—over surfaces of many shapes and sizes, the information required is indicated immediately in true inch units on the instrument dial. No computations or other scaling methods are ever necessary.

While Profilometers are widely used and are invaluable for final inspection purposes, they are particularly useful in the production departments. Now designed for use on 115 or 220 volt 50-60 cycle power lines, they can be kept in constant operation wherever the required current is available. This instrument and its uses are fully described in literature TE which may be had on request.

Profilometers Help To Save Time and Materials

When Profilometers are used to check setups at the time the first piece is produced . . .

- **Rejects of parts because of incorrect surface finish can be eliminated.**
- **Waste of following machining time is reduced to a minimum.**
- **Man hours are spent only on fully productive operations.**
- **Critical materials do not end up in a scrap heap.**

**Profilometer is the trade name registered in the United States Patent Office by Physicists Research Co.*

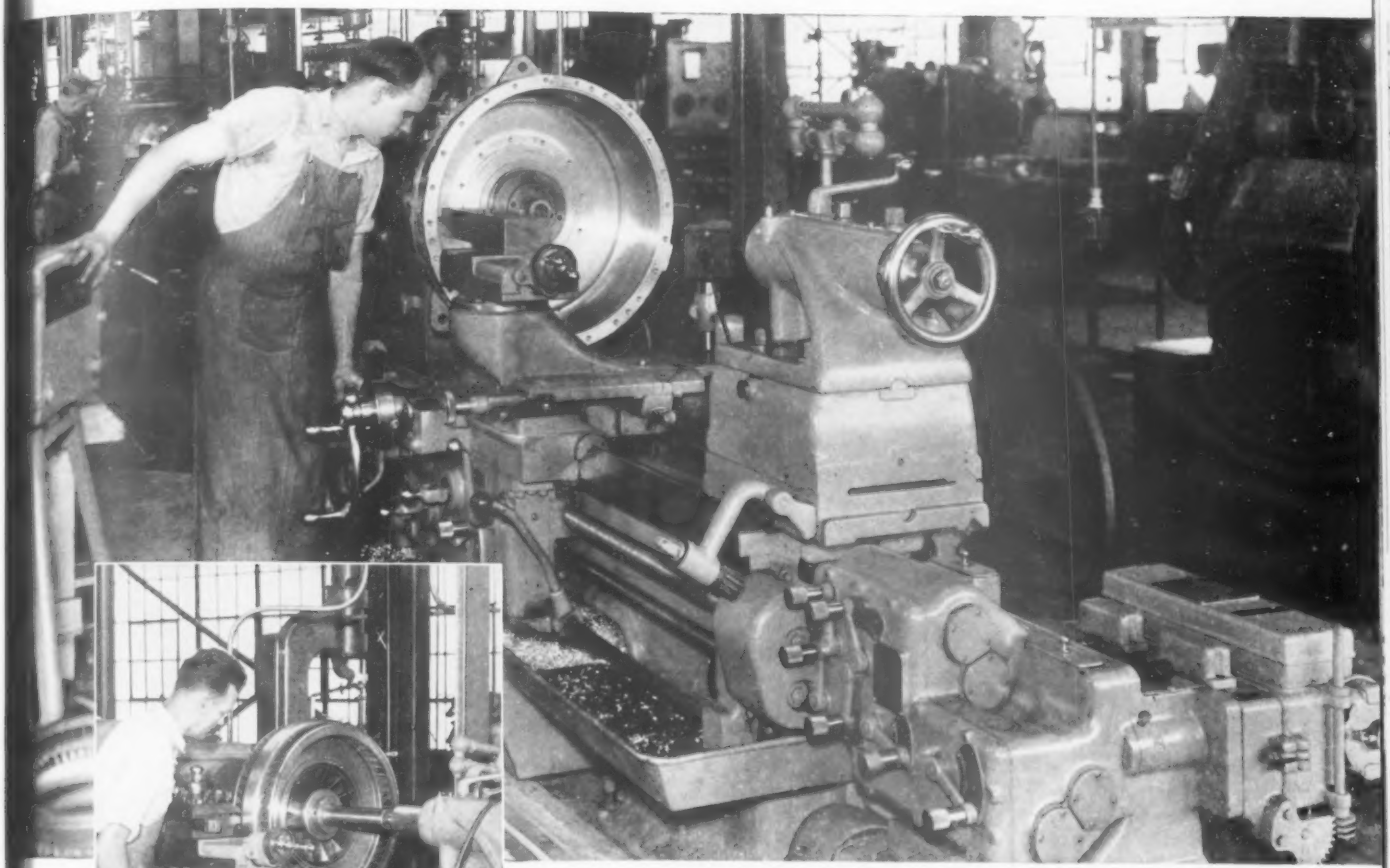
PHYSICISTS RESEARCH COMPANY

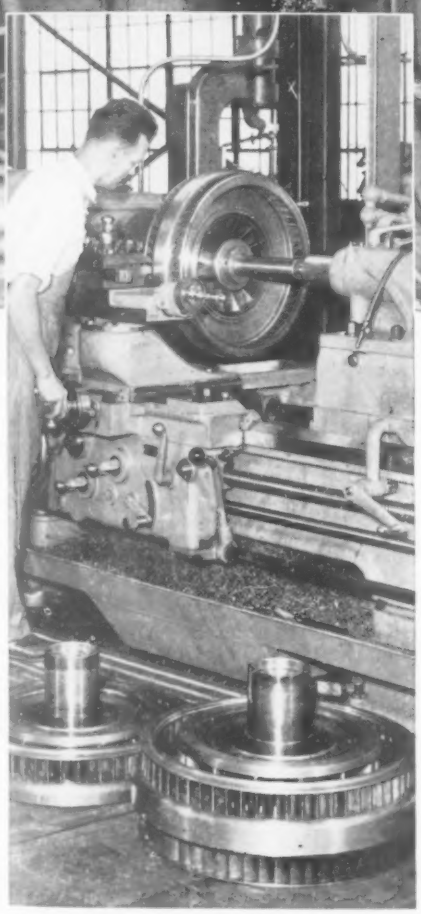
Manufacturers of Electronic Production Gaging Instruments

545 SOUTH MAIN STREET ANN ARBOR, MICHIGAN

Careful job analysis saves time, material and money..

Keeps production on schedule





Large photograph shows the use of Monarch lathe with automatic Keller control, permitting greatly increased production of this aluminum housing. Inset illustrates turning of rotors, with manual control.

This plant, converted to war work, had a new job to do—building fluid drives.

The large diameters of aluminum main housings and rotors suggested 36″ lathes, with Monarch-Keller controls for finishing the contour surfaces. Careful job analysis showed the duty requirements could readily be met by a much smaller lathe, if raised to provide 36½″ swing. Because of the lightness of the work, small size controls were deemed adequate.

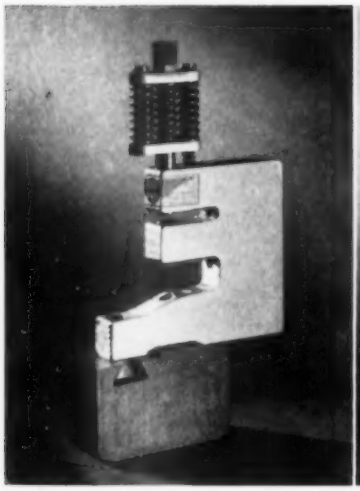
Monarch 22″ Model M Lathes were ordered and put to work months before the larger lathes could have been shipped. Their lighter weight saved precious critical materials. Many million machine gun bullets can be bought with the $58,000 saved in first cost. Best of all, production is being kept on schedule.

Such applications of shop knowledge are the everyday work of Monarch field engineers. If they can help you in your War effort, they are at your service.

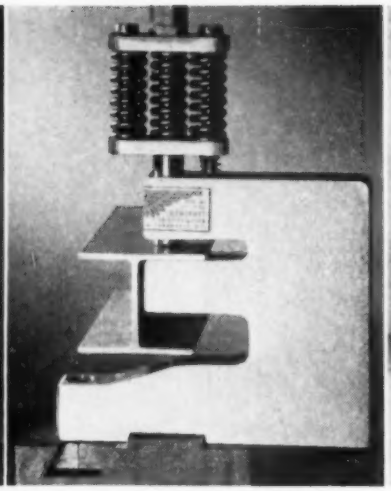
THE MONARCH MACHINE TOOL COMPANY···SIDNEY·OHIO

MONARCH LATHES

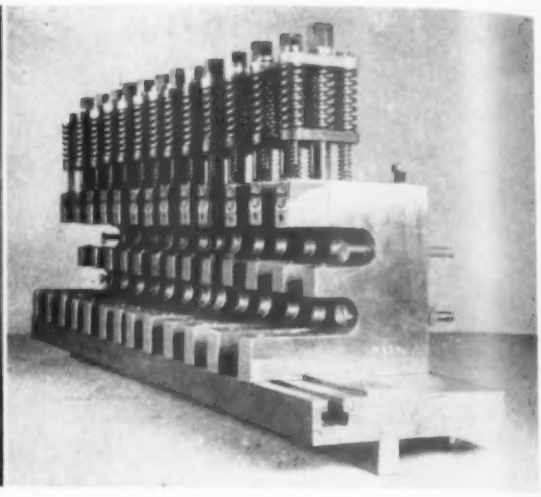
COVER THE TURNING FIELD



Showing one Wales Type "E" Hole Punching Unit on section of press brake rail.



Example of typical "H" section being punched by Wales Type "E" Unit.



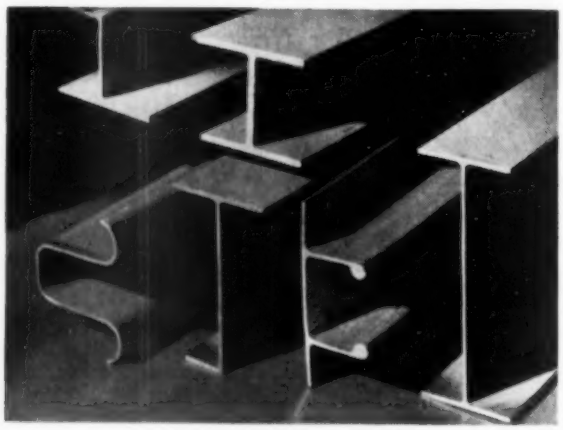
This line-up of units is an example of a few units set on a short section of press brake rail. Wales Punching Units can punch over 200 holes at the same time on a rail.

NEW! WALES TYPE "E" UNITS FOR PUNCHING HOLES IN EXTRUDED AND SHAPED SECTIONS

From light trainers to HEAVY BOMBERS, Wales Type "E" Units "lick" one of Aviation's most difficult hole-punching problems,—punching a series of holes simultaneously in extruded shapes on press brakes.

Center projection carrying die member extends into all kinds of shapes and provides clearance for other legs in the lower gap. The work rests on top of the die during punching operation.

A few of many shapes that have been punched by Wales Type "E" Units. **CALL ON STRIPPIT ENGINEERS TO SOLVE YOUR HOLE PUNCHING PROBLEMS.**



TIME SAVING . . . MONEY SAVING FEATURES OF WALES HOLE PUNCHING UNITS

Nothing is attached to press ram . . . punch and die holder unit is self-contained . . . punch and die are always in perfect alignment . . . each individual unit can be removed or reset on rails . . . punches, dies, guides, and strippers can be removed from holders quickly . . . interchangeable punches and dies punch various sizes and shapes with the same holders . . . die-setting time and press "down time" are cut from hours to minutes . . . provides unlimited scattered and straight-line set-ups.

THERE'S ALWAYS SOMETHING NEW IN THE WALES LINE

Last month it was Wales "CD" Units, this month it is Wales "E" Units, and next month,—announcement of a new Wales Hole Punching Unit, so keep posted by writing to—

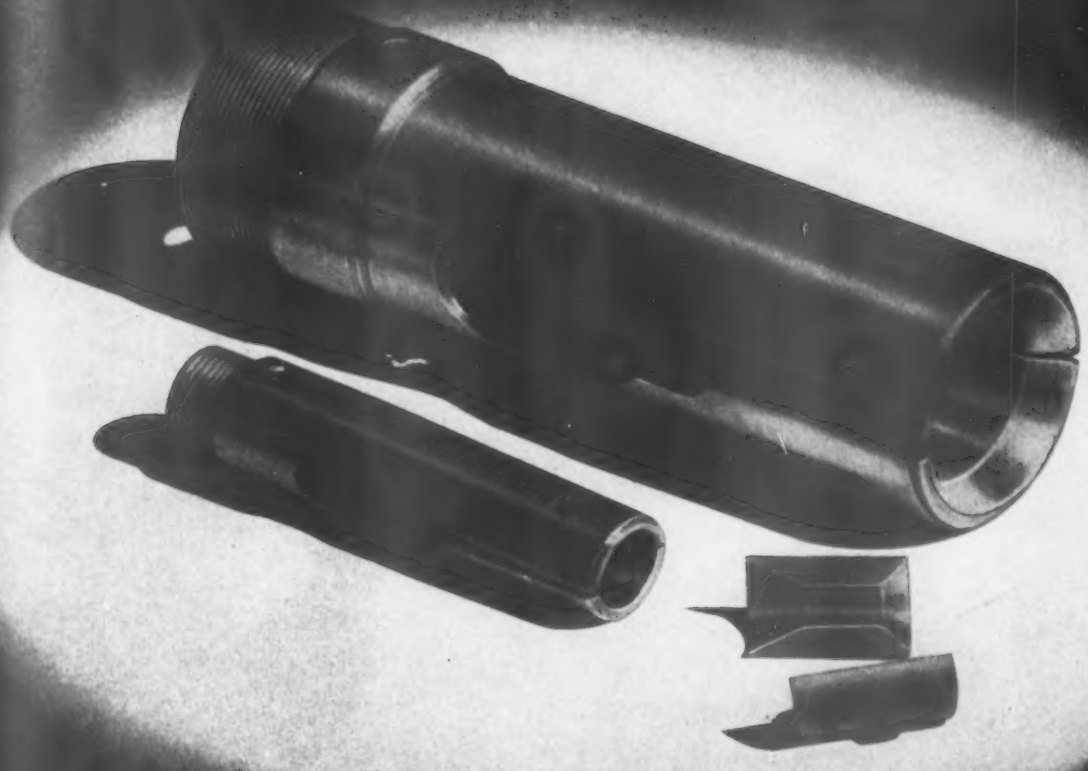
THE STRIPPIT CORPORATION
345 Payne Avenue **North Tonawanda, N. Y.**
GEORGE F. WALES, President

SPECIALISTS IN PUNCHING AND NOTCHING EQUIPMENT

HARDINGE

Style "B"

Master Feed Fingers and Replaceable Pads



Save Material

The change-over to a new size or to renew the same size involves inexpensive pads only instead of expensive solid feed fingers.

Today this saving is more important than ever before as the economy not only saves money for you, but also conserves steel which is of vital importance.

Many other advantages of using HARDINGE Style "B" Master Feed Fingers with either steel, bronze or nickel cast iron pads will be immediately appreciated when you put them into use.

Learn all the advantages by asking for this illustrated bulletin containing complete information. Available to purchasing agents, superintendents, foremen, engineers, set-up men and operators in organizations which have a screw machine department.

HARDINGE BROTHERS, Inc., ELMIRA, N. Y

ON ENGINEERING PROBLEMS TODAY

Time is too vitally important for you to spend it for experimenting

Engineering problems involving factors with which you are familiar naturally present no unusual difficulties.

But there are *few* normal problems now. Industry today has been—and still is—overwhelmed with production tasks that have no precedent. The problems are different.

And one of the most important factors is TIME! It cannot be devoted to having someone grope aimlessly for answers to problems you haven't ever encountered.

Call on Pioneer—one of the largest and best equipped engineering organizations in the country. Augmented by the great wealth of experience already accumulated through its many years of contact with a wide variety of problems, Pioneer's work with all phases of engineering war equipment — started long before Pearl Harbor —has a definite advantage for you. It enables Pioneer to approach your particular problems with more than average information.

ENGINEERS
DESIGNERS
CONSULTANTS

PIONEER ENGINEERING AND MANUFACTURING CO.

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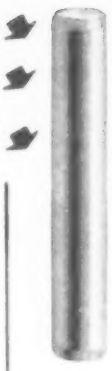
DETROIT, MICH.



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DOWEL PINS

All Die Makers' Supplies

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PRECISION DIE SETS

TO INSTRUCT NEW MEN in the handling of DIAMOND TOOLS

we will send you a valuable booklet. No charge, no obligation.

KOEBEL DIAMOND TOOL CO.
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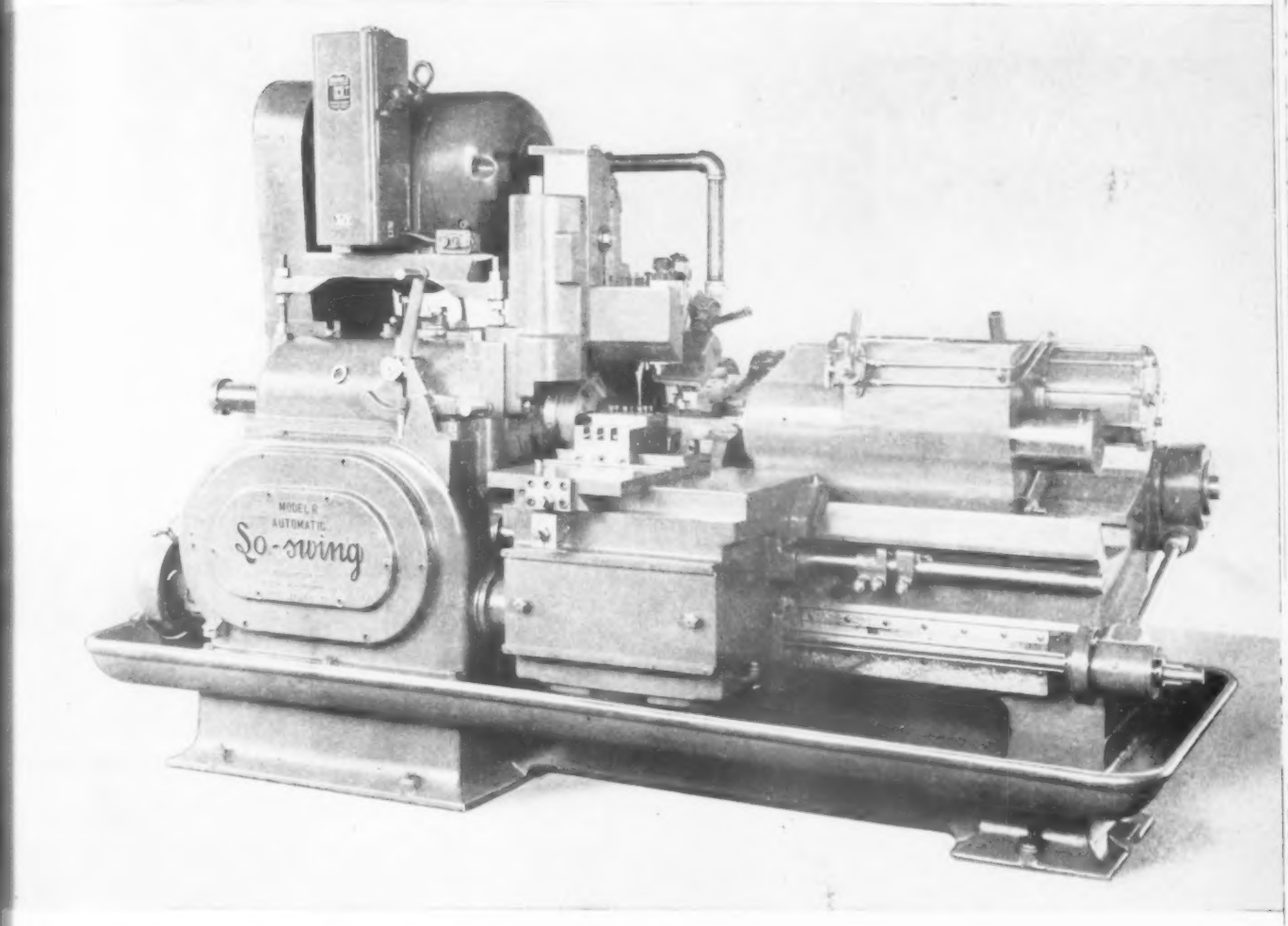
DIAMOND TOOLS

Multi-Point, Multi-Set, Multi-Edge, and Single Set. Diamonds for all Industrial Purposes.

MACHINE OF THE MONTH

PARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK



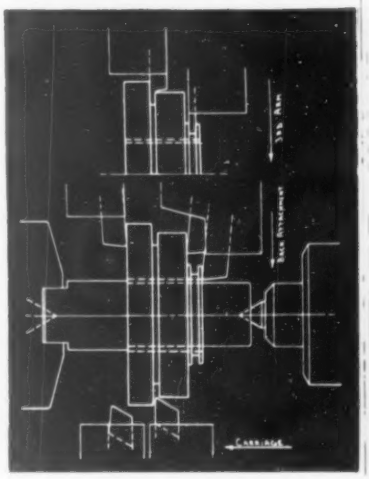
HEAVY TRACTOR GEARS, IN A WIDE VARIETY OF SIZES, ARE TURNED, FACED AND GROOVED ON A SINGLE MODEL R-14 *Lo-swing* LATHE

Problem: To provide a single automatic lathe capable of turning, facing and grooving a variety of sizes of heavy steel gears and requiring minimum change-over time from job to job.

Solution: The R-14 *Lo-swing* Lathe was chosen for this job primarily because it had the power and capacity necessary to handle heavy steel gears, varying in size from 4¾ to approximately 10" diameter. The built-in, Quick Change-over Mechanism on this lathe also provided a simple and speedy means for varying the carriage stroke, as required for each individual gear job.

Forged gear blanks come to the lathe with only the hole finished. Drive is by arbor through this hole as seen in the drawing opposite which illustrates typical tooling for one of the gears.

In order to simplify tooling, this Model R-14 *Lo-swing* was equipped with a standard Third Slide or Overarm which carries the grooving tools. Turning is accomplished with the Front Carriage tools while tools on the Back Attachment face the sides of the gears.



LATHE NEWS from SENECA FALLS

TRATEGIC

As a Direct Hit on an Aircraft Carri

We have fixed our sights. Our e
set-up is revolutionized. Now we
centrate on Mounted Wheels and
fied Grinding Wheels 3" and unde
diameter — 24 hours a day, every

Our central location makes speedy
liveries certain.

- Wheels flow off our production
and into your plant in a swift, ste
stream. Speed assured on all or
Count on us to meet bottleneck e
gencies.

- Valuable man hours saved in your p
There is no waiting for wheels.

- Customers — new wartime and ol
get the same high quality that has b
maintained since we introduced the
Mounted Wheels 45 years ago. We
take care of all your requirements
wheels 3" and under.

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You should have our new catalog w
illustrates in actual colors and sizes
largest line of Mou
Wheels made. Send
copy today.

AMERICA'S HEADQUARTERS FOR MOUNTED WHEELS

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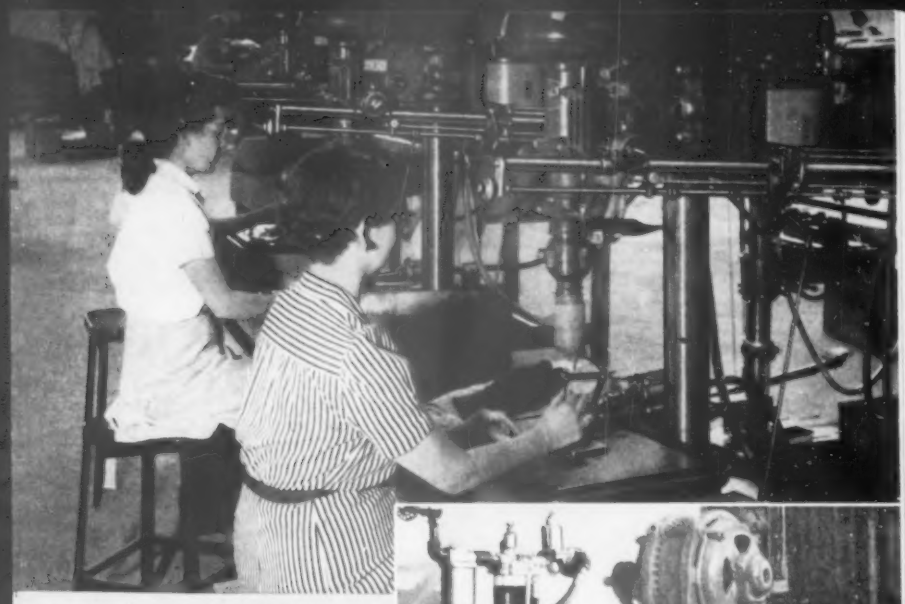
Name .....

TE-2

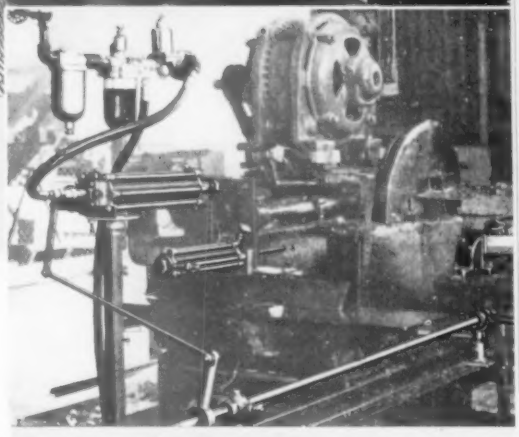
CHICAGO
WHEEL & MFG. CO.
1101 W. Monroe St., Dept. TE, Chicago, Ill.

Senacon

its a PUNCH production with ONTROLLED IR-POWER!



INCREASED OPERATOR EFFICIENCY
An average of 1200 parts per hour per operator (a 300% increase over hand operation) is obtained with these four drill presses equipped with foot-controlled Senacon Drill-Press Feeds.



INCREASED MACHINE TOOL EFFICIENCY
Senacon Motor and Hydro-Check operate table of disc-typ metal cutting saw. Substitution of power feeding for man ual operation boosted production 250% and decreased saw breakage and wear from 25 blades per day to blades per day.

SENACON *CONTROLLED* Air-Power provides a versatile new method of doing a hundred-and-one machine-tool jobs *faster* and *better*. The *full control* of air-power attained with SENACON devices — a control never available in conventional air-cylinder practice — markedly boosts the efficiency of *both* machine tool and its operator.

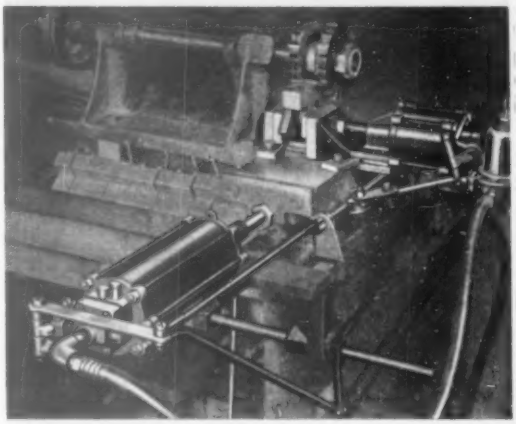
HOW YOU CAN USE *CONTROLLED* AIR-POWER

SENACON *Controlled* Air-Power Devices are used for such production boosting operations as: Moving tools and work-pieces to and from each other . . . Opening and closing holding fixtures . . . Operating latches and clutches . . . Furnishing prime-mover power for fractional horse-power operations . . . etc. With these production helps . . .

Operator Efficiency is Increased by eliminating the need for skilled feel for the machine movement; reducing the number and magnitude of required hand operations; reducing operator fatigue; and providing operator off-time for additional work.

Machine Tool Efficiency is Increased by reducing cycle time; continuously maintaining optimum cutting rates; and reducing tool consumption.

Machine Availability is Increased by making possible the improvisation of special machines (often from simple salvaged parts) to replace scarce expensive standard equipment.



INCREASED MACHINE TOOL AVAILABILITY
This straddle mill built around a Senacon Air-Motor an Air-Vise is typical of the improvisations possible with Senacon Controlled Air-Power Devices. Mills 330 Dural "T" Sections per hour.

Senacon Controls Applied Air-Power In Four Fundamental Ways:

1. By regulating the initial pressure of the operating air.
2. By appropriate beaning of the individual exhaust air blasts from the air motor. *
3. By utilizing special motor control valves and valve-operating mechanisms. *
4. By using an exclusive hydraulic control to regulate either the primary motor movement, or movement of the mechanism operated by the motor. *

*Patents Pending

What about your machine tool operations? Are production rates dropping and tool consumption climbing as the average skill of your labor drops — are there machines in your plant where elimination of hand operations will permit substitution of women for men operators, or provide operator off-time for additional work — are you employing complex, scarce machinery to do simple jobs which could as readily be done by improvised, special machines? If so, it will pay you to investigate SENACON Controlled Air-Power! Full details are yours for the asking. Write today for Bulletin 101!

PNEUMATIC M... Sena... TOOL DEV...

SMITH-JOHNSON CORPORATION
BENDIX BUILDING LOS ANGELES, CALIF.

36 HOLES in Propeller Blade Bushing *held to* ACCURACY *of* ±.0005″ *with* HIGH FINISH

ve) All dimensions in
boring the 36 high-
holes in these Bronze
ller Blade Bushings
eld to ±.0005".

STOKERUNIT SIMPLEX PRECISION BORING MACHINE

Precision Bores Each Hole in 16 Seconds

A widely known manufacturer of airplane propeller parts is regularly using a battery of Stokerunit Simplex Precision Boring Machines to insure superior finish and precision accuracy in critical boring operations.

In the production of these alloy bronze propeller blade bushings, for example, an extremely fine finish with close tolerances is required in finish boring the 36 holes in the flange. All dimensions—roundness of hole, dimensions between holes and distance from center of bushing—are uniformly held to ±.0005".

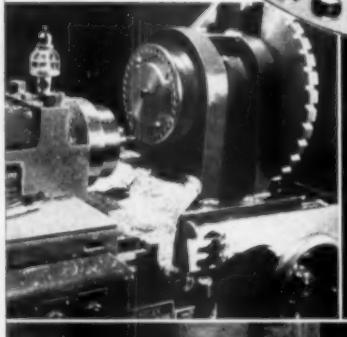
PRECISION ACCURACY AND FINE FINISH MAINTAINED IN PRODUCTION

In this setup, the Stokerunit Simplex Precision Boring Machine bores one hole at a time every 16 seconds in alloy bronze bushings — hardness 90-100 Rockwell. Hole is .3125″ in dia. ±.0005″ by 1/4″ deep. Work slide is equipped with constant reciprocating feed, and indexing is done by hand when work is clear of tool. Feed is 4 7/8″ per minute; spindle speed 1750 r.p.m. Every rigid requirement of accuracy and finish is consistently maintained.

VERSATILITY — Stokerunit Simplex Precision Boring Machines can be adapted to a multiplicity of precision boring operations — for either short-run or production work. They can be furnished with single or multiple spindles, depending upon your requirements. Over 25 models are available in both mechanical and hydraulic feeds and cover practically the entire range of precision boring applications.

Profit with precision accuracy, finer finish and increased production in your precision boring operations. Consult our engineers for a study of your parts and production problems.

For specific recommendations, send blueprints of parts with production requirements. No obligation.



(Left) One hole at a time is precision bored every 16 seconds.

(Right) The Simplex maintains precision accuracy and fine finish in production.

(Below) Partial view of battery of Stokerunit Simplex Precision Boring Machines in plant producing airplane propeller parts.

BULLETINS with Complete Data!

Write today for these two booklets covering our entire line of Simplex Precision Boring Machines. Full details and specifications of each type are included.

STOKERUNIT CORPORATION

DESIGNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHINE

4528 WEST MITCHELL STREET • MILWAUKEE, WISCONSIN

"LOGAN"
HYDRAULIC EQUIPMENT

AS APPLIED TO A SIMPLEX SHELL CENTERING MACHINE

This Simplex Shell Centering Machine, built by the Stokerunit Corporation of Milwaukee, is equipped with a Model "HR" "LOGAN" Hydraulic Cylinder and a "LOGAN" Expanding Mandrel. Model "HR" "LOGAN" double acting, rotating type Hydraulic Cylinders are designed for the efficient operation of all chucks, mandrels and other work holding devices required to be mounted on rotating spindles. The 6-Jaw "LOGAN" Expanding Mandrel holds the shell securely in place during the work operation. "LOGAN" Hydraulic Equipment provides rapid, positive action and rigid support of work. Let "LOGAN" Representatives and Engineers make recommendations on your hydraulic problems.

★ **LOGANSPORT MACHINE, INCORPORATED** ★
902 PAYSON ROAD LOGANSPORT, INDIANA
Manufacturers of Air and Hydraulic Devices, Chucks, Cylinders, Valves, Presses and Accessories

WARTIME PEACETIME

KEEP 'EM CUTTING

The Wells Way!

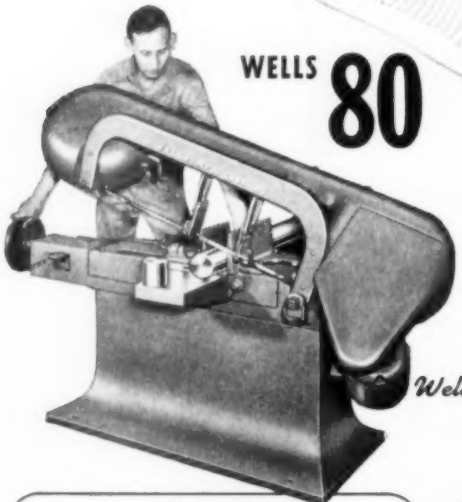
Choose a Wells and you will have a saw that is not only equal to the demands of war production but a tool that will help you solve your metal cutting problems in peace time competition, for years to come.

Their long experience in saw design and manufacture has enabled Wells engineers to build the greatest durability and cutting efficiency into the New Model 80 and V-12.

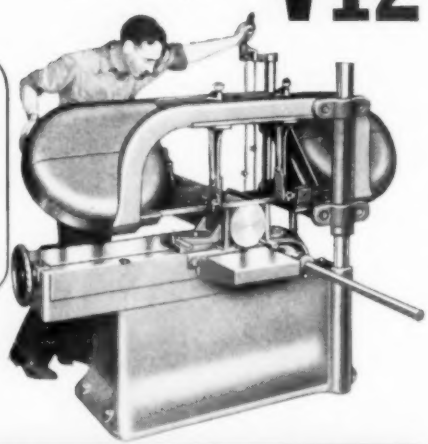
Tested and proved on tough cutting jobs like tool steel and castings of all types and shapes, they are ready to do your metal cutting with speed and accuracy—for the duration and many years after.

Phone your Mill Supply dealer or write direct.

WELLS **80**



Wells Has Established Leadership **V12**



SPECIFICATIONS
SERIES 80 METAL SAW

Capacity: Rectangle	8" x 16"
(spec. bowed guides)	5" x 24"
Rounds	8" dia.
Speeds: ft. per min.	60, 90, 130
Motor	Specifications optional

V-12 METAL SAW

Capacity: Rectangle	13" x 16"
Round	13" dia.
Speeds: ft. per min.	30, 90, 150
Guides	Adjustable
Feed	Hydraulic-Controlled
Vise	New quick acting type
Motor	Specifications optional

A large stock of blades is available at all times

Wells SAWS

WELLS MANUFACTURING CORPORATION

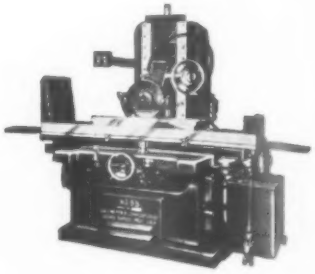
Wells METAL CUTTING BAND SAWS

1212 MONROE ST. • THREE RIVERS, MICHIGAN

SPEED & PRECISION

with

Grand Rapids Hydraulic Feed Surface Grinders



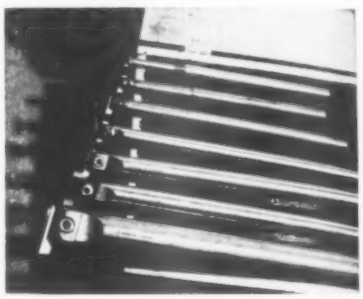
While keeping pace with the Defense Program Grand Rapids Grinders are maintaining the features that have made them one of the leading machine tools of the Nation.

One piece base and column insure accuracy at high speeds attainable on all Grand Rapids Grinders.

Write for Catalog GL-100

GALLMEYER & LIVINGSTON CO.
110 Straight Ave., S. W.
GRAND RAPIDS MICHIGAN

EVEREDE BORING BARS



Number 3 Set

These are the only boring bars on the market having the economical triangular bit, permitting the use of a larger bar diameter as the bit cuts ahead of the bar. This new design insures rigidity, making higher boring speeds and heavier cuts possible.

Everede Boring Bars are made of the finest heat treated nickel steel and each bar is furnished with six triangular high speed steel bits.

The Everede Boring Bar also permits the use of a solid stellite or carbide tool bit by clamping the bit in the "V" Type grip holding it firmly without danger of breakage.

Write for descriptive folder.

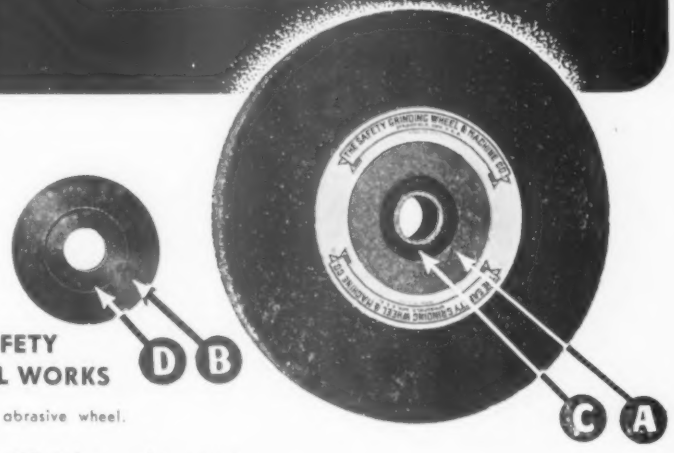
EVEREDE TOOL CO.
WILLIS STUTSON
184 N. Wacker Drive Chicago
Representatives in principal cities

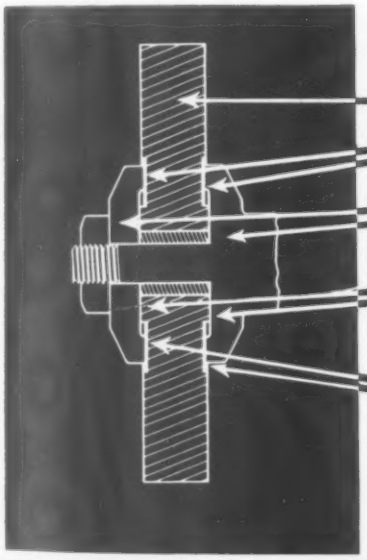
NEW "SAFETY" DEVELOPMENT FOR PORTABLE GRINDERS . . .

"SAFETY" GRIP-LOK GRINDING WHEELS

Grinding wheel failures are most generally caused by one of the following: 1—Injury during shipment, 2—incorrect mounting of the wheel, 3—Accidental injury during operation.

Insure against injuries, property damage and costly time delays by insisting on the portable grinding wheel which prevents a broken wheel from flying apart . . . the new SAFETY GRIP-LOK GRINDING WHEEL.





. . . HOW SAFETY GRIP-LOK WHEEL WORKS

1. Represents the abrasive wheel.
2. Safety Grip-Lok Wheel has annular recesses on both sides concentric with arbor hole.
3. Standard flange same as provided on all portable grinders.
4. Relief in flanges. When wheel is mounted and tightened flanges 3 enter recesses 2 and overhang ends of abrasive hub.
5. Resilient composition washer is located in recess 2 on both sides of wheel. When pressure is brought on washer, flanges 3 enter recesses 2 by compressing the washers.

When the flanges ("B" in photograph of collar above) compress the composition rubber and cork washer in the recess ("A" in photograph of wheel above) they allow the raised hub, "C", to come up under the recess of the flanges, "D", and act to prevent segments of a broken wheel from flying outwardly.

We can promptly supply "SAFETY" GRIP-LOK WHEELS in all grains and grades. For the phone number of the "Safety" Sales Office or Warehouse nearest you, consult the list below.

"REMEMBER PEARL HARBOR"

SAFETY

Established 1891

THE SAFETY GRINDING WHEEL & MACHINE CO.

Main Office and Factory SPRINGFIELD, OHIO, Phone 4651

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• Birmingham—3-3323 ★ Chicago—Brunswick 2000 ★ Cleveland—Cedar 9292 ★ Detroit—Trinity 1-5420
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Looking down, from grinder head end.

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MULTI—PURPOSE
INTERNAL
GRINDER

Grinds ¼ to 18" diameter holes, up to 9" deep, straight or tapered. Sav-way grinder offers greater flexibility and will handle a wider range of work than has heretofore been possible on any one machine. Sturdily constructed throughout and suitable for both tool room and production grinding. "Bulletin MI" giving complete specifications sent on request.

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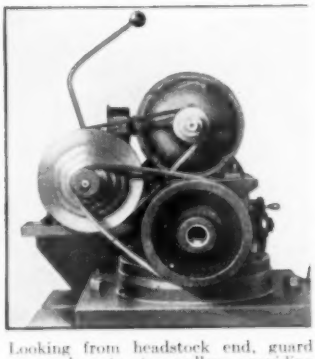
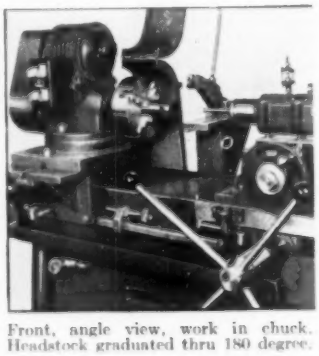


Looking from headstock end, guard removed; note step pulleys providing various work head speeds. Headstock may be slid crosswise any desired distance up to six inches.



Front, angle view, work in chuck. Headstock graduated thru 180 degree.

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★ Machine Tool Division ★
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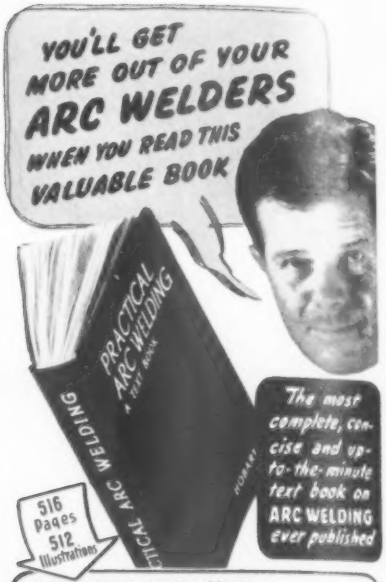
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OUR JOB to design and manufacture high production tools for boring, recessing, facing, reaming, undercutting, chamfering and milling, so that you may do

YOUR JOB producing the machines of war in record time with the speed and exactness to supply the United Nations' soldier the weapons to do

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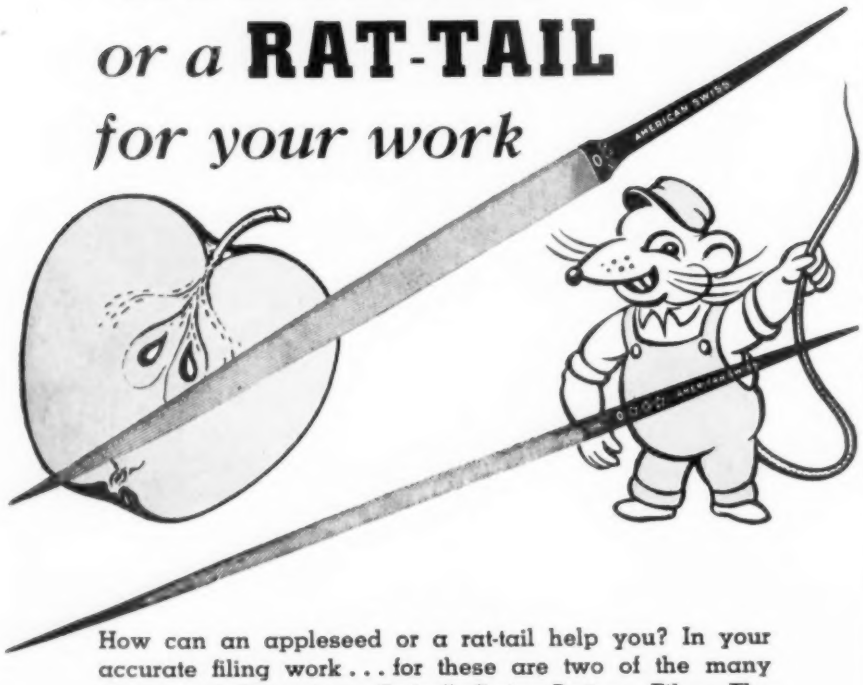
for your work



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Cuts Nos. 00, 0, 1, 2, 3, 4 and 6

Hand	Pippin	Half Round (Coarse Cut)
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Pillar (Extra Narrow)	Square	Mill (2 Round Edges)
Half Round	Three Square	Finishing
Slim Half Round	Metal Saw	Round Edge Joint
Half Round Ring	Slitting	Square Edge Joint
Crossing	Checkering	Die Sinkers
Knife	Parallel Round	Needle
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• Three grades of diamonds. Common quality $12 per karat. Medium quality $24 per karat. Select quality $48 per karat. (Contour template diamonds supplied only in Medium and Select quality.)

All diamond sizes ¼ to 10 karat *are* nib mounted for immediate shipment . . . Billed subject to approval. Specify quality of diamond wanted. We recommend a minimum size of one karat for each 6" diameter of grinding wheel. (24 hour resetting service, $1.00 post paid.)

Grinders instruction card free.

Send specifications and prints for prices on turning and boring *form tools.*

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LAPPING COMPOUND

Grade No. 38-900A

A NEW compound with a NEW abrasive sharp enough to lap and polish hardened materials, nitrided, chrome plate etc. Gages, Dies, Aviation parts — yet fine enough for the final finishing.

This compound has a special heavy oily paste base especially made for dilution with spindle oil, kerosene, sperm etc.

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Two Norton Machines

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THE 6 x 18" Hydraulic Surface Grinder is equally adapted for grinding single pieces or production lots. Available options of spindle construction, drive and equipment add to its efficiency for specialized applications.

The versatile Norton No. 10U Lapper will accommodate a wide range of gauges and tools. While advantages of accuracy and uniformity obtained by machine lapping were previously recognized, the quantities of many tools did not justify this method. Today's requirements demand it. Being well suited for lapping plated surfaces, this machine fits into the tool rebuilding programs of progressive shops.

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Worcester, Mass.

M-450

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NO. 10-U LAPPING MACHINE

Get FLEXIBILITY FOR WAR WORK
With BAKER MACHINES!

MODEL 217
HEAVY DUTY
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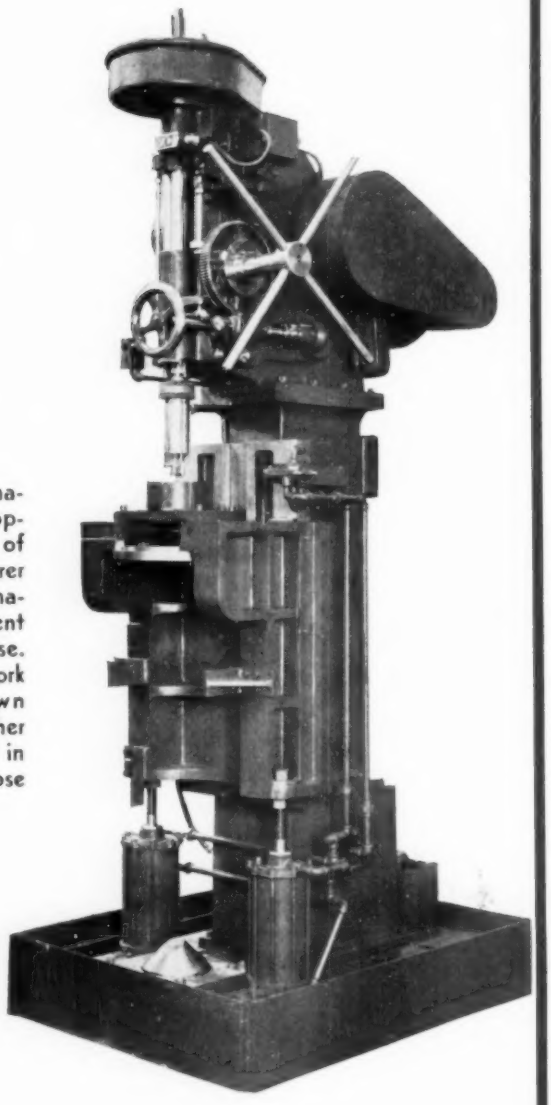

The illustration shows this machine specially tooled for operation in the nose end of bombs. One manufacturer uses a battery of these machines to perform 4 different operations in the bomb nose. On this machine the work holding fixture is shown mounted in place, together with the cutting tools used in boring and facing the nose end.

Write for Complete Information

Operations handled on this machine include: 1. Drill from the solid. 2. Rough coredrill and rough face. 3. Finish ream and face. 4. Tap. These operations are handled on individual machines, rechucking for each operation. This mechanical feed machine is arranged with holding fixture and increased clearance to accommodate 500 pound bombs. With extra adapters, the machine can also handle 1000 pound bombs.

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TOLEDO **OHIO**

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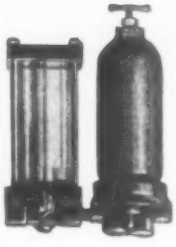
AIR-LINE FILTER and AUTOMATIC LUBRICATOR



PROLONGS THE LIFE OF COSTLY BEARINGS in the case of pneumatic tools and other items due to insufficient lubrication. Now more important than ever owing to the scarcity of replacement parts.

Removes 96% to 97% of All Water, Dirt and Scale

from air-line. Air passes through a series of brass discs with .002 spacings, which are 2½ times finer than 120 mesh screen, affording the finest degree of filtration that can be obtained by any known method.

Then, as the air passes through the head of the Lubricator, oil is delivered into the purified air-line in any desired volume.

A combination of this kind is only as efficient as the filter unit of the assembly.

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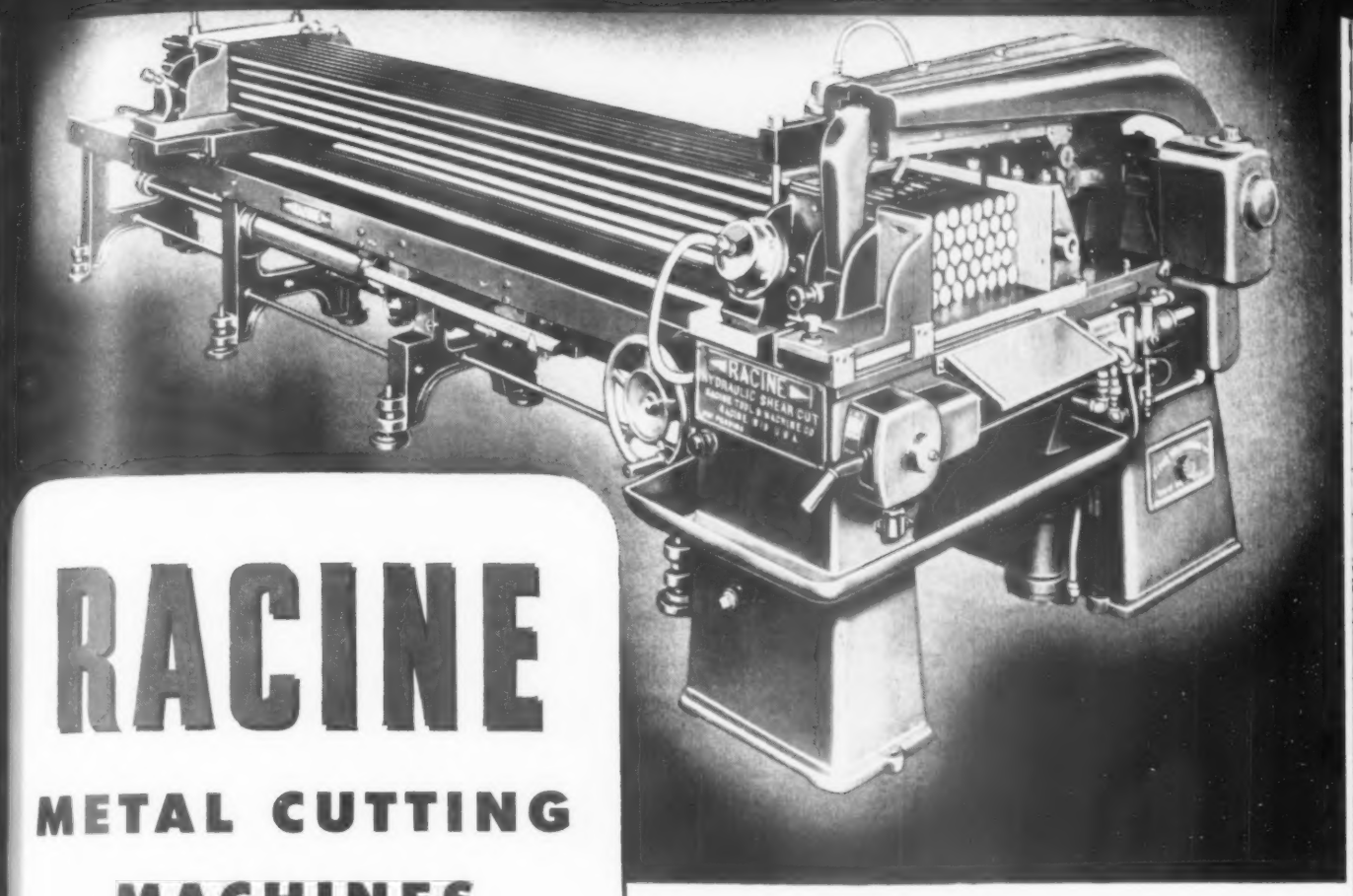

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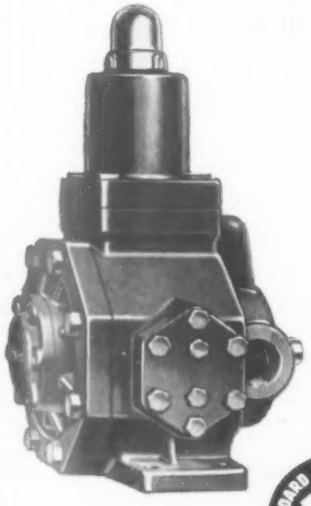
Standard for Higher Quality and Greater Precision

THESE Hydraulic Fed and Controlled Metal Cutting Sa with oil cushioned operation save blades, permit fas cutting and heavier cutting feeds. Designed and built for m ern production—cutting time and costs can now be accurat determined.

Modern designing of Racine saws produces these outstandi features. Hydraulic control allows complete range of feed: positive progressive and self-compensating progressive. Sin lever control—inexperienced help can operate. Extra heavy pi shaft and wide pivot bearing construction in arm of Saw Gui prevents cocking or binding strain in bearings and ways.

Racine's complete line includes models for general purp and production cutting in a wide range of prices and siz Capacities 6″ x 6″ to 20″ x 20″. Automatic Stock Feed Machin as illustrated, are also available.



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A Modern Source of Hydraulic Force

Speed up the production of your power operated equipment with Racine Variable Volume Oil Hydraulic Pumps and Valves.

Pressure from 50 to 1000 lbs. per sq. in. for holding, pressing, clamping, feeding and forming operations.

No relief valve needed. Pumps only the amount of oil you require to do the job. Exclusive "Vane Type Variable Volume" feature. For vibrationless action in modern machine design. Capacities 0-12, 20 and 30 gal. per minute.

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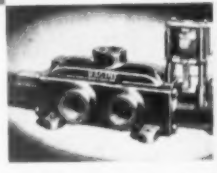

Our Engineering Department will be glad to help you work out your hydra application problems. Address your request for complete information to Dept. 1

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STANDARD FOR QUALITY AND PRECISION

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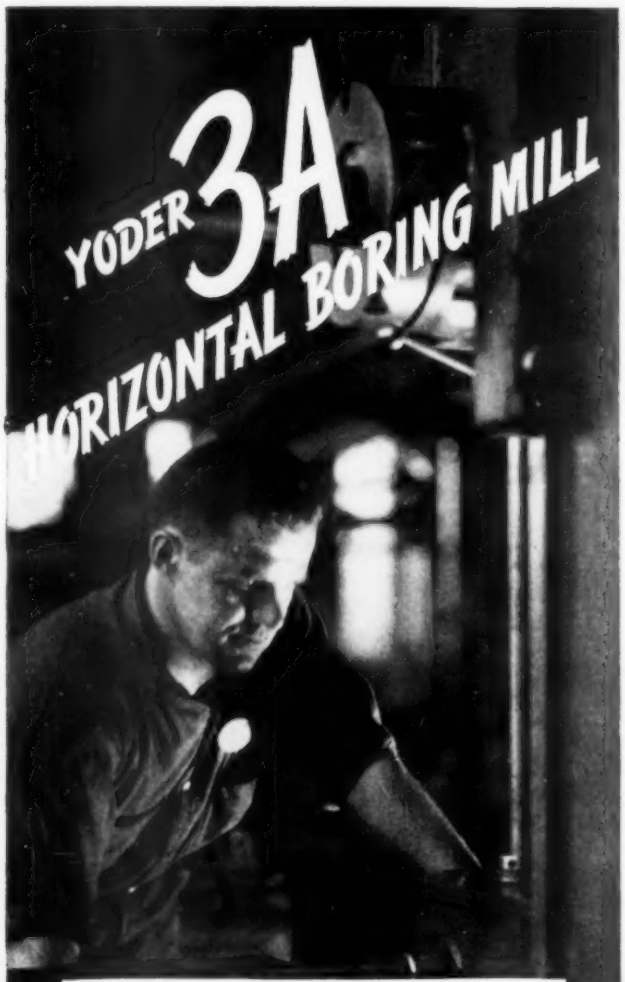
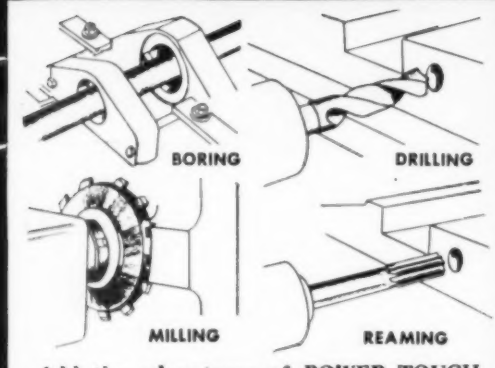
YODER 3A HORIZONTAL BORING MILL





Add the advantages of POWER TOUCH CONTROL and POWER FLOW DRIVE to the other exclusive advantages of the YODER 3A HORIZONTAL BORING MILL. These make it the newest, most flexible and soundly engineered of this popular type of multi-purpose machine tool.

War production now .... postwar production eventually, will make a Yoder 3A Horizontal Boring Mill a MUST as a general utility tool in a large majority of machine shops.

Reasonable delivery dates are again possible. Let us hear from you. We have a bulletin.

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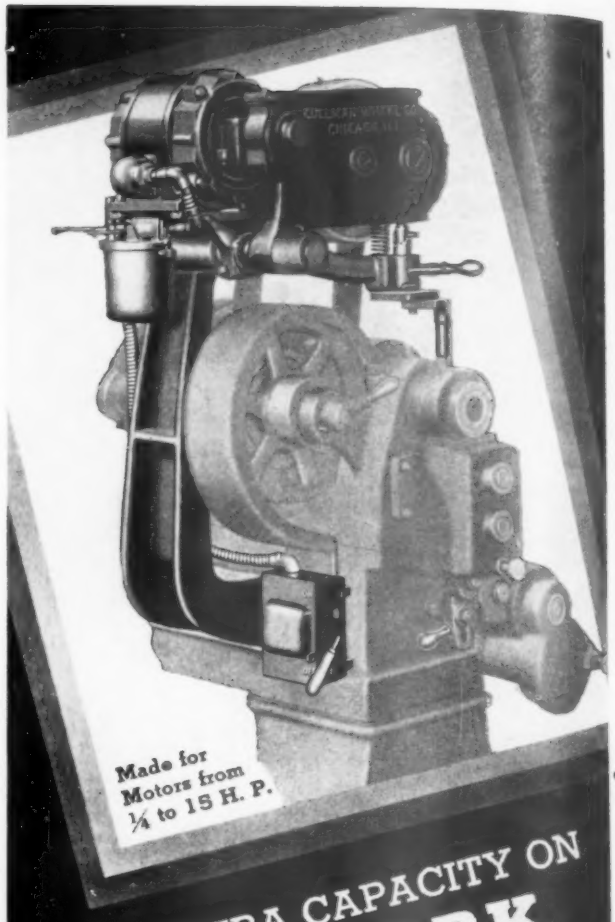

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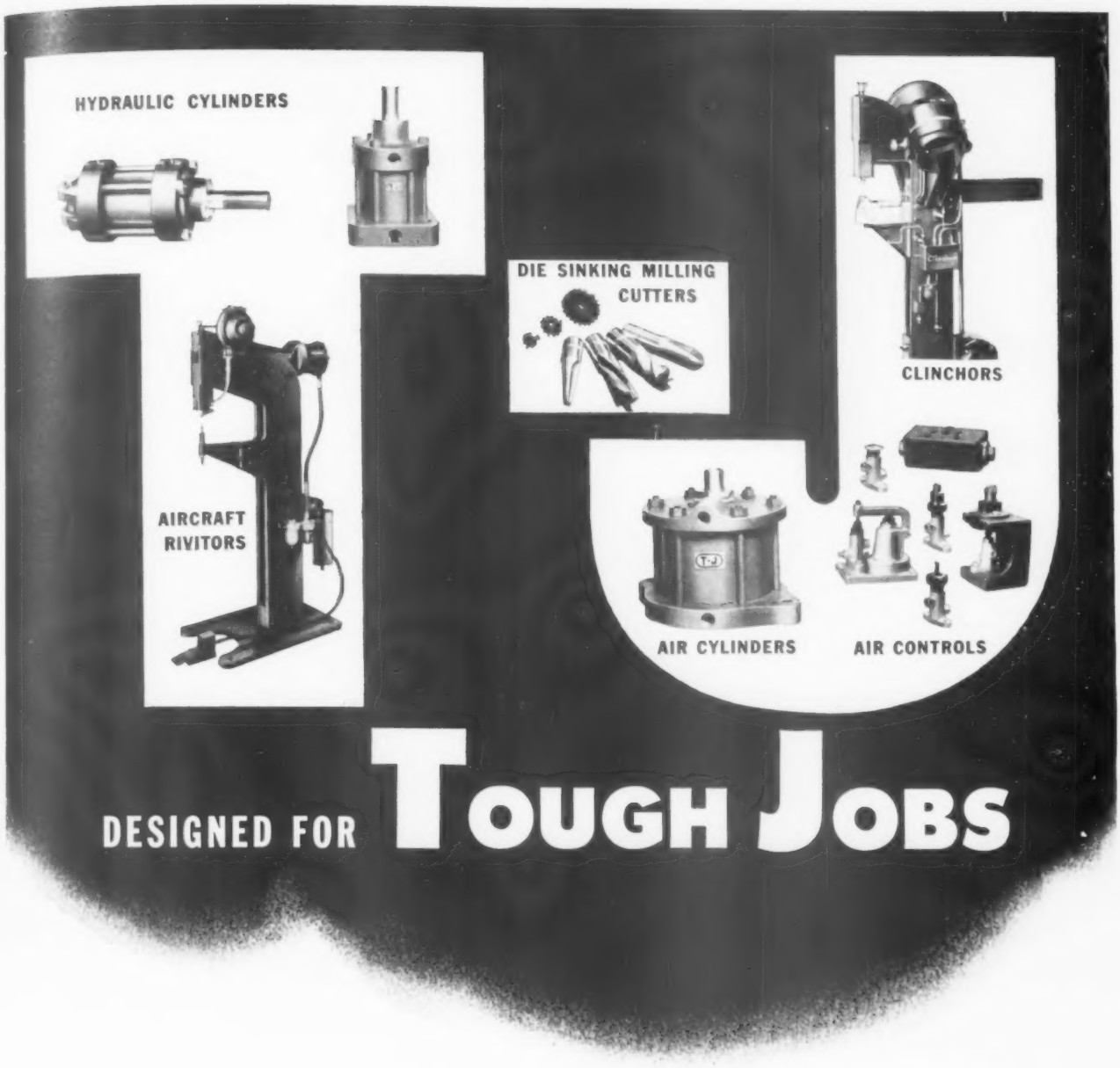

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RIVITORS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHORS

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On lathes, millers, grinders, etc.

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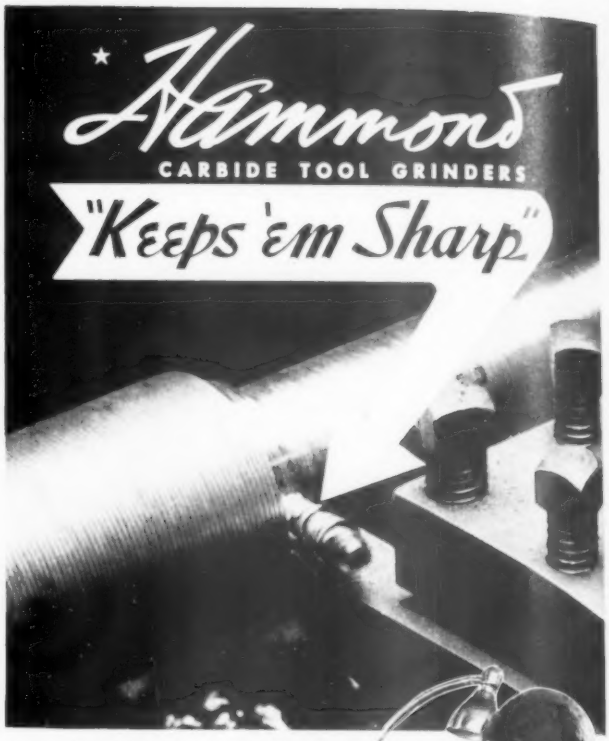
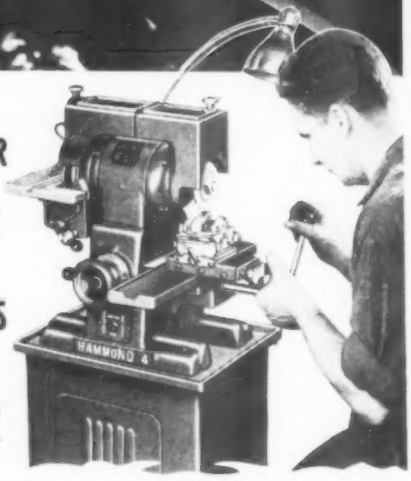
"Keeps 'em Sharp"



*CHIP BREAKER and CARBIDE TOOL GRINDERS



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GRINDERS FOR COMPLETE CARBIDE TOOL SHARPENING MAINTENANCE

Maintaining highest efficiency in YOUR cutting tools to prolong tool-life and insure constant high production rates means one thing: Grind 'em frequently, KEEP 'EM SHARP!

Here is YOUR answer to that problem.

Hammond offers YOU many different types in its wide line of Carbide Tool Grinders for rough and finish grinding, and the grinding of chip breaker grooves into Carbide Tools. Each type is modern—with up-to-the-minute features.

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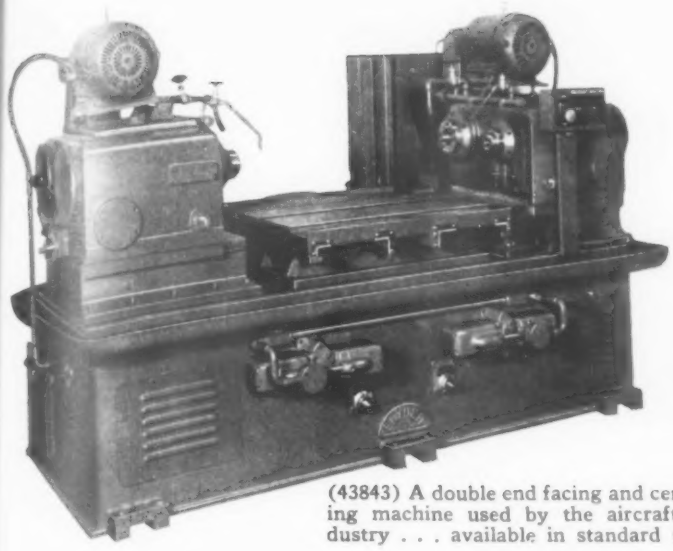
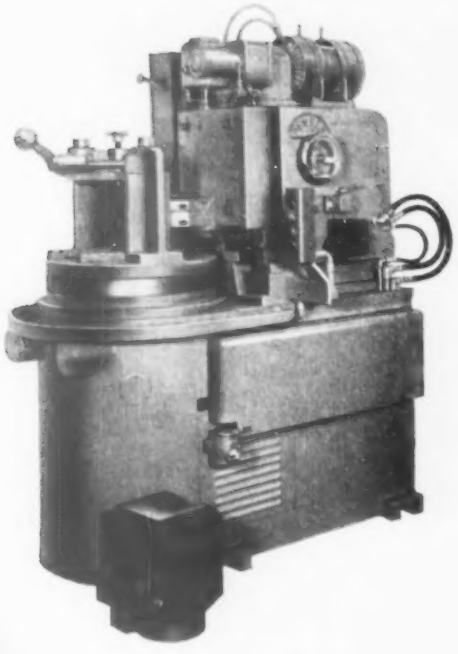


(43843) A double end facing and centering machine used by the aircraft industry . . . available in standard sizes



(43376) A special Snyder machine that applies auto production principles to making gun parts

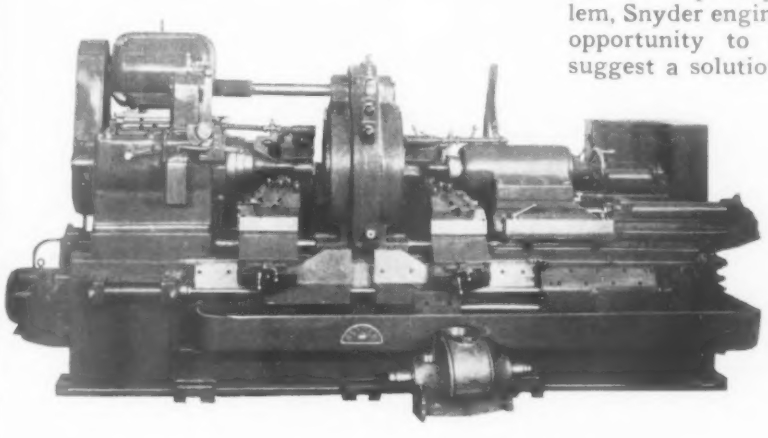
A GOOD POLICY FOR '43:
See SNYDER for SPECIAL MACHINES

Illustrated here are only four of many machines designed and constructed by Snyder during 1942 to meet a wide range of specific war production problems. For further details of Snyder machines, send for new catalog.

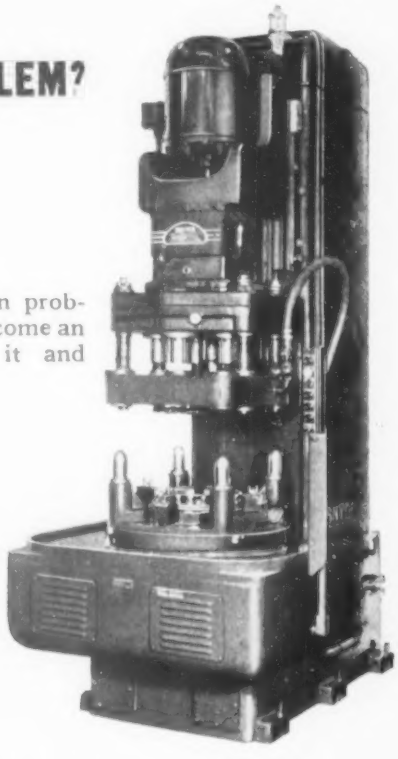
WHAT'S YOUR PROBLEM?

- ☐ Increased production
- ☐ Lower unit cost
- ☐ Closer tolerances
- ☐ Better surface finish

Whatever your production problem, Snyder engineers welcome an opportunity to analyze it and suggest a solution.



(43218) A heavy-duty, hydraulic turning machine for tank parts . . . stepped up estimated production 65%



(43112) A Snyder general utility drilling machine used to make aircraft parts

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designers and builders of machinery for **HIGH** *production at* **LOW** *unit cost*

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FASTER
EASIER
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In a Single Operation

Because — "The Soft Rubber Binder Cushions The Abrasive"

Brightboy's ***rubber binder*** controls the abrasive action, providing a unique, highly gratifying finished surface. ***At the same time*** it cleans and polishes, bridging the gap between a grind and a buff. Ideal for close-tolerance work.

No special setups required. Brightboy is ready for immediate use. Available in wheels, blocks, sticks, rods and special shapes for innumerable manual, bench machine and drill press applications. Safe and easy to use by any worker. No special training necessary.

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BRIGHTBOY INDUSTRIAL DIVISION
Weldon Roberts Rubber Company Newark, N.J., U. S. A.

THESE HYDRAULIC UNITS WILL GIVE YOU ADDITIONAL MACHINING CAPACITY
[with Present Equipment]

1 *Compact Hydraulic Unit for Ribe Chambering Machine.*
2 *Complete Self-Contained Hydraulic Unit for Special Machine.*
3 *Panel Unit complete except for tank which is integral with Machine.*
4 *Self-Contained Hydraulic Unit—Complete with Pumps, Valves and Tank.*

A Simple Change in YOUR Machine Design

By simply converting your mechanical feed transmission to smoother hydraulic feed you can shift all the equipment now used to cut gears, splines and cams to other urgent work. In addition, you release the precision machine tools now used to mill, drill and bore mechanical feed transmission housings for other work. You also gain all the skilled man power now used on these operations. Figure your own savings. Then design your machines with hydraulic feed. Here's how:

USE BARNES UNIT-TYPE HYDRAULIC FEED TRANSMISSIONS

The Barnes Unit-Type method of securing hydraulics for metal working machines and other mechanical structures offers one of the fastest and most efficient hydraulic design services available.

Complete circuits are designed and built from Barnes standard hydraulic elements — pumps, valves, etc. These are assembled in compact, self-contained units or panels simple to install — **SAVES DESIGN AND ASSEMBLY TIME, SPEEDS DELIVERY.**

TWO METHODS AVAILABLE

Method 1—Barnes Self-Contained Hydraulic Unit can be designed with necessary pumps and valves to complete hydraulic functions of your machine. Oil reservoir is included — providing cylinder space and connecting two pipes to each cylinder constitutes your total hydraulic effort.

Method 2—Use a Barnes Panel Unit—similar to above, except provision must be made in machine for oil reservoir and motor mounting.

FREE DATA

40 page booklet contains detail descriptions of Barnes Hydraulic elements and typical installation circuits. Write for your copy today. Ask for Bulletin T.E. 243.

John S. Barnes Corporation
DETROIT SALES OFFICE
503 NEW CENTER BLDG.
TR-1-1706
MAIN OFFICE AND FACTORY
ROCKFORD, ILL.

PRODUCTION records in numerous plants make it safe for any operator to promise increased output when he tools up with TECO.

TECO Carbide Tools have proved time and again, on job-for-job comparisons with other carbides, that they operate at higher speeds—hold their cutting edges longer—produce more pieces between grinds—and save down time for re-tooling.

Learn for yourself how the rigidly controlled density, hardness and uniformity of TECO Carbide Tools can step up your turning, boring, facing and other machining operations. Greatly enlarged facilities enable us to make prompt shipment on grades and styles for practically every machining need.

NEW TECO CATALOG
Just off the press!

Gives full data on types, styles and sizes of Teco Carbide Tools for turning, boring, facing and cut-off operations. Write for your copy today.

TUNGSTEN ELECTRIC CORPORATION • 570 39th Street, Union City, N. J.

Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Representative: Architects & Builders Bldg., Indianapolis, Ind.

TECO *Pioneers in Tungsten Carbides for over a Quarter Century* **CARBIDE TOOLS**

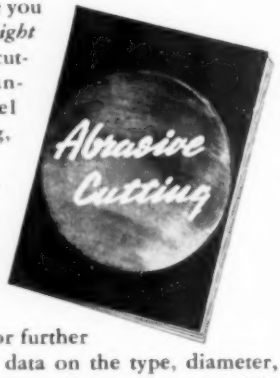
HOW WOULD YOU CUT THIS BAR?

What diameter wheel is best? What wheel thickness is best? How many cuts from one wheel? How fast should you feed?

You will find the answers to those and hundreds of other questions vital to production abrasive cutting in the Andrew C. Campbell Division's

NEW, FREE, ILLUSTRATED BOOKLET

Abrasive Cutting



The 28 pages of this booklet give you data you can use to your profit *right now* if you are doing production cutting of steel, annealed or unannealed, brass, bronze, monel metal, aluminum alloys—tubing, solid bars or flat.

Do you *know* the relative advantages of dry and wet cutting? The proper method of applying coolants? How to control wheel speed and wheel feed to save wheel costs and, on many jobs, eliminate the need for further finishing? Have you convenient data on the type, diameter, thickness and speed of wheel for cutting stock up to 6" in diameter? Those are some of the subjects covered in this free booklet, *"Abrasive Cutting."*

WRITE FOR FREE COPY

If you are doing production cutting, get a copy of this valuable booklet. NO CHARGE. All you need do is write for it on your company's letterhead, requesting that a Campbell engineer call.

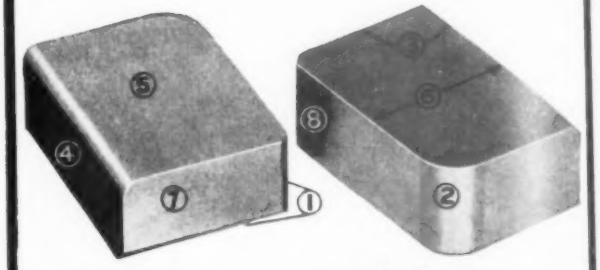
Campbell

ABRASIVE CUTTING MACHINES

ANDREW C. CAMPBELL DIVISION
BRIDGEPORT • CONNECTICUT

ACCO
AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

Faster on 7 Different Operations



1—chamfering
2—rounding
3—squaring
4—forming radii
5—grinding flat surfaces
6—grinding parallel surfaces
7—polishes
8—removes shaper marks

Model (G-4 vertical) position of unit shown at right

Model G-4 Surfacer—An ideal second-operation tool that takes the place of costly hand-filing or wheel-grinding. Women workers use it easily and confidently with no "machine fear" to slow them up.

PORTER-CABLE

Wet Dry BELT SURFACERS

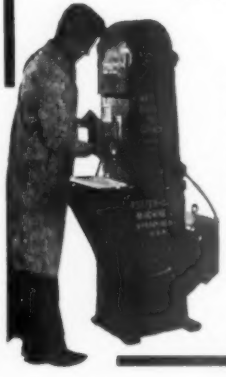
for Speeding Tool Room Jobs

Just present the work to the abrasive belt, and this amazing new surfacing method chamfers, rounds, squares, forms radii, grinds flats and parallels, and secures high polish. All with an ease, precision and rapidity that makes this Porter-Cable machine one of the most useful to come out of today's drive for more speed on close-tolerance operations.

Applying millions of minute, diamond-hard abrasive points driven in straight lines at terrific speeds, the wet-belt method does in seconds what would normally require minutes. Used free-hand or with simple fixtures, it eases the load on hard-pressed millers, planers and shapers, handles more jobs, in greater variety, in a clean, dustless manner, at savings which quickly offset the costs of the machine.

PORTER - CABLE MACHINE CO., INC.
1610-2 N. Salina St., Syracuse, N. Y.

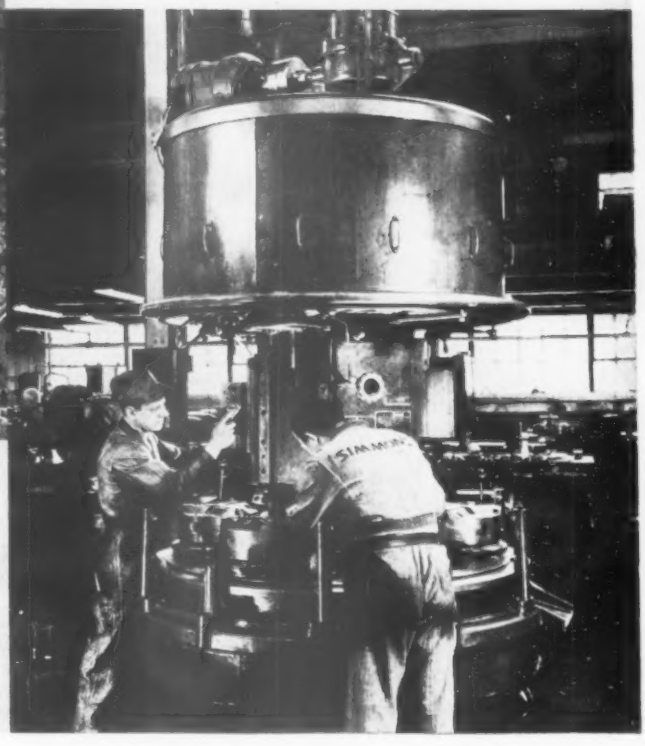
5 to 50 Times Faster in Production!



Even unskilled workers find Porter-Cable Belt Surfacers (model G8) easy and safe to use. Thus you get the double advantage of releasing your skilled workers for more important jobs as well as reducing operator cost per piece. Call the local Porter-Cable man (see classified 'phone book), or write for our new booklet showing them any applications of belt surfacing.

WAR
wears 'em down!

Photo by U.S. Army Signal Corps



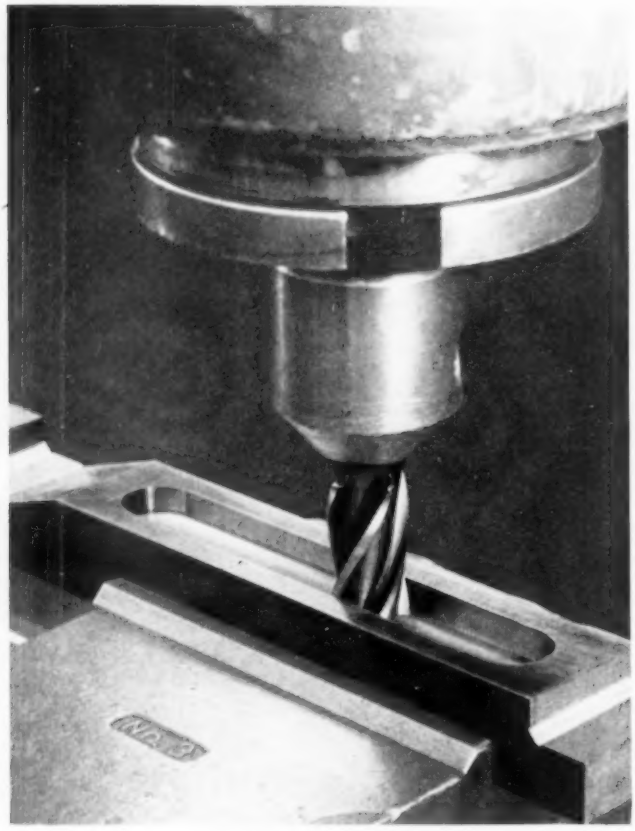
machine tools, like tanks, need time out for repairs

The balance in battle often hangs on the ability to return damaged weapons to action faster than the enemy. ● This war's battles start on your production lines. Machine tools are your weapons. Operated twenty-four hours a day, often in semi-skilled hands, they undergo punishing wear and tear. As a result, they can develop more troubles in a single year of intensive day-and-night shifts than in a decade of normal production. ● Because replacement of these vital weapons is both difficult and time-consuming, you have a two-fold responsibility: to keep your machine tools at peak efficiency by preventive maintenance and to repair them speedily when they do break down. ● Simmons, specialists in rejuvenating metal-working equipment, has returned to production many hundreds of used machine tools of all types and sizes. This company has the facilities and experience to solve your rebuilding problem quickly. Ask for full details covering *The Simmons Way*.

Simmons Machine Tool Corporation, 1810 North Broadway, Albany, N. Y.

ARMY E NAVY

SIMMONS *Engineered* MACHINE TOOL REBUILDING



CUTTING OIL-HARDENING STEEL WITH A PUTNAM END MILL

A Putnam Hi-Speed End Mill roughing a lightening slot in a sine bar in a well known Detroit plant. The material is tough but the Putnam End Mill makes the cut smoothly and quickly. For roughing or finishing, you'll get best results with these end mills which have always been known to "cut faster and last longer".

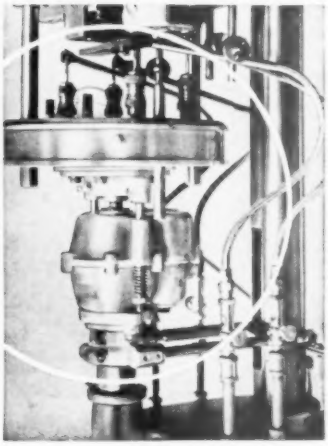
THERE IS A SCARCITY

of the steel which goes into your cutting tools. Be sure to turn in your discarded tools to the tool steel mills. More scrap returned to the mill means more new tools available to you.

PUTNAM TOOL COMPANY

2987 Charlevoix Ave. Detroit, Michigan

IMPORTANT TO USERS OF *Ettco-Emrick* MULTIPLE DRILLING and TAPPING HEADS



Nothing is more important to the war effort than **maximum production** in an **uninterrupted flow.** From each piece of equipment you must obtain the highest output it is capable of giving. To get full benefit of the high productivity of Ettco - Emrick Multiple Spindle Drilling and Tapping Heads it is essential to observe the following points regarding their use and care.

1. Your Ettco-Emrick Multiple Drilling or Tapping Head is an individualized piece of equipment. It was engineered to give you **maximum** drilling or tapping production on a specific part. With it, you received recommendations as to the best way to handle parts, the most effective design of work holder, the proper drills or taps to use and the proper operating speed. To get the intended production, **all** of these recommendations must be followed. If in doubt on any point, ask us.
2. Don't attempt to use any but the drill or tap chucks supplied with the Heads.
3. These Heads are high-speed, precision-made tools and, like any such tool, must be given a certain amount of care. For example, the gear case requires a good grade of grease—but not too much. Again, when in doubt on any point, ask us.
4. When replacements become necessary, don't attempt to make them yourself. The quickest and surest way is to return the Head to us. These Heads are made of standard parts which we have in stock.
5. Remember, we are at all times ready to help you get the high production and excellent service these Heads give when properly used and cared for.

IMPORTANT to Non-Users

If you need higher production in drilling or tapping or both, Ettco-Emrick Multiple Drilling and Tapping Heads will give it to you. They provide both the method and equipment for drilling or tapping the **maximum number of holes simultaneously.** Get full details in **Bulletin No. 3.** Copy mailed to you on request.

ETTCO TOOL CO.

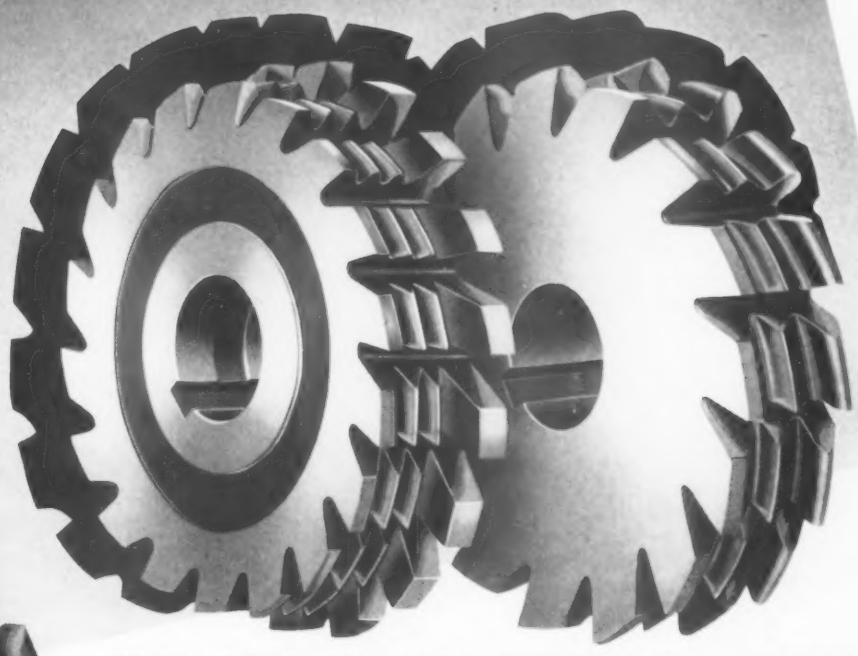
586 Johnson Ave., Brooklyn, N. Y.

DETROIT CHICAGO

The Famous *Ettco-Emrick* DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

FORM RELIEVED CUTTERS

are economical when you have to mill intricate shapes and outlines



WHEN CONSIDERING FORM CUTTERS, NOTE THE FOLLOWING:

There are an infinite number of shapes, both symmetrical and irregular in outline, which can be milled efficiently and economically with Midwest Form Relieved Cutters. These cutters, provided with eccentric relief behind the cutting edges, always maintain the original outline of form when they are sharpened by grinding the faces of the teeth. However, conditions are so varied in the application of form cutters, no definite rules can be offered for making a proper selection as to type and form. When considering form cutters, send a blueprint of part to be milled; outline the cutter on the surface to be milled; furnish all dimensions of the form shown, with tolerances; specify arbor diameter, keyway size, and rotation. On unsymmetrical forms, designate below the outline, rotation, as "bottom going" or "bottom coming." Whenever possible, form cutters should have undercut teeth, the degree depending upon operating conditions. When sharpening a form cutter, the amount of undercut which is marked on the cutter should be preserved, since the form was corrected for this exact amount of rake . . . Other examples of Midwest Form Relieved Cutters may be found in Midwest's catalog 17 of Precision Metal Cutting Tools.

Your Security and Freedom depend on your Country Winning the War. There is no alternative. Your Country needs your Fighting Dollars for Victory. Invest them Now in United States Bonds and Stamps.

END MILLS • SLEEVES • COUNTERBORES • SPECIAL TOOLS • DRILLS
REAMERS • FORM TOOLS • CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

MIDWEST *Precision* METAL CUTTING TOOLS

MIDWEST TOOL & MFG. CO. • 2364 W. JEFFERSON AVE. • DETROIT, MICHIGAN

Amco Gages are Unexcelled for QUALITY, ACCURACY and SERVICE

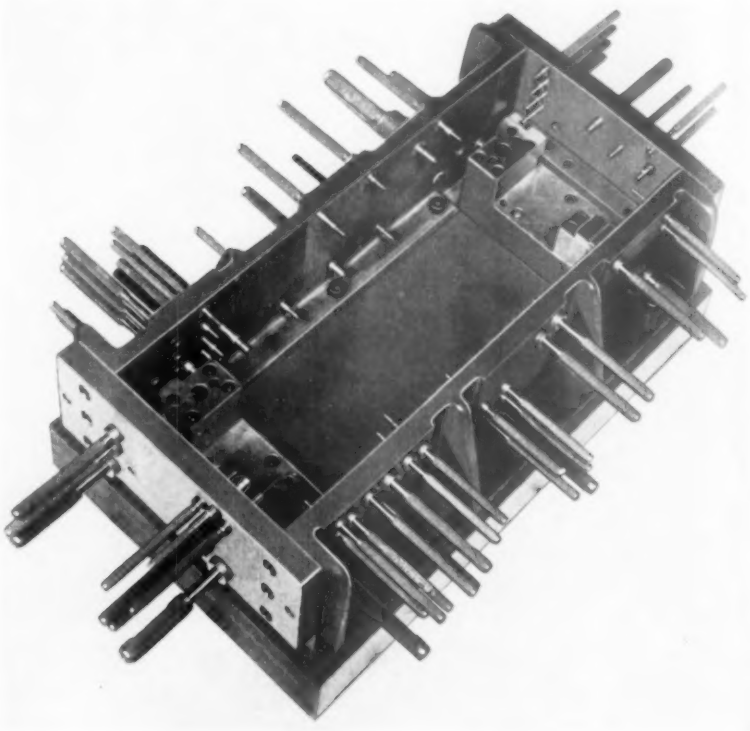
We have the best equipment obtainable for the economical manufacture of Precision Fixture Gages. GOOD DELIVERIES.

★

ILLUSTRATED AT RIGHT IS A SAMPLE OF OUR PRODUCT

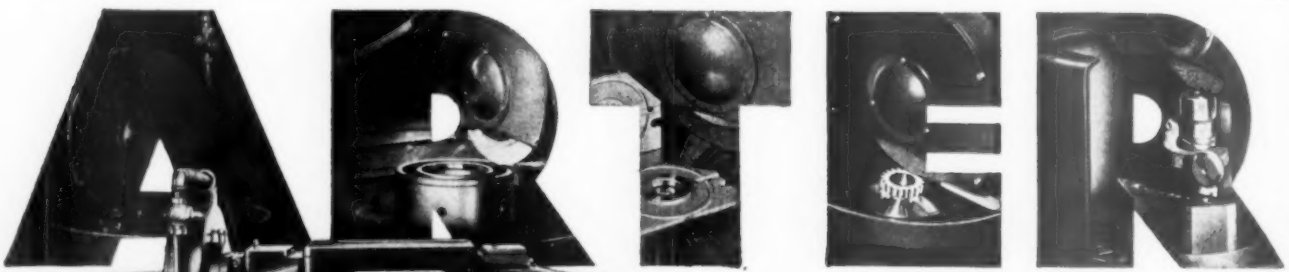
★

Straight Side, Serration, Involute Male and Female Splined Gages, Plug, Ring, Snap, Flush Pin, Profile, Fixture, Length, Width, Thickness and Relation Gages. We have a complete Spline Engineering Service for your convenience. Gages with close tolerances are normalized and stabilized. All gages are inspected at 68° Fahrenheit. May we quote on your requirements.



AMCO GAGE COMPANY

19760 W. Eight Mile Road • Detroit, Michigan



ARTER ROTARY SURFACE GRINDERS made for fast, close tolerance work. You can depend on ARTER for production-plus.

ARTER ROTARY SURFACE GRINDERS have great vertical capacity . . .give you simplicity of operation . . . extreme precision.

Are you getting all possible production from your grinders?

ARTER grinding engineers will help you to secure MAXIMUM PRECISION PRODUCTION.

ARTER GRINDING MACHINE CO.
WORCESTER, MASS. U.S.A.

Blasting a Bottleneck with EGYPTIAN'S New Machine Tool Finishing System

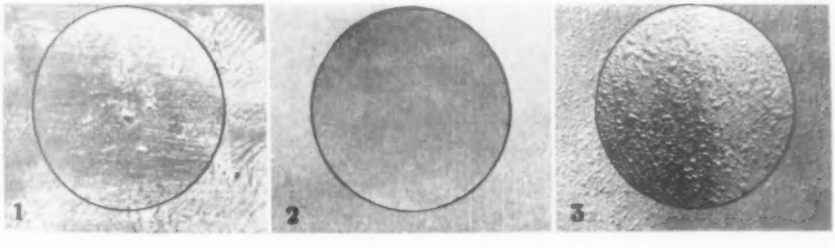
In compliance with W.P.B. Limitation Order L-108, this fast yet thorough method of finishing machine tool surfaces eliminates several steps formerly used, thus conserving time, materials and manpower.

The EGYPTIAN three coat system produces a stipple effect, minimizing those rough spots found in every casting by blending them with the rough finish. Can be used for a smooth finish, too. In either case, two stipple coats and one of EGYPTIAN Machine Tool Enamel are all you need. No primer required.

Fast, air drying, oil and alkali resistant. Apply with gun or brush. Always finishes level, rounding out as it dries. Try it.

Send for trial order at drum prices. Have you a copy of our new Gov't "Spec." Book? Gladly sent free on request on business letter-head.

Ask for "Spec." Book TE



These unretouched photos with portions within circle full scale show, 1. Bare Casting. 2. Same surface after one pressure pot spray coat has been applied. 3. After application of medium stipple second coat over first coat. Left half shows surface after a coat of Machine Tool Enamel has been applied over the two previous coats.

THE EGYPTIAN LACQUER MANUFACTURING CO.
ROCKEFELLER CENTER, NEW YORK, N. Y.

EGYPTIAN FINISHES

EGYPTIAN Superior FINISHES

NEW Rouse HAND MILLER FOR SMALL PARTS

The NEW Rouse Hand Miller will help you speed up your small parts production, and enable you to get maximum output with inexperienced help.

The Rouse Hand Miller is a high-speed, ball bearing, motor driven machine for making light cuts in brass, aluminum, and steel. It will handle efficiently small rounding and burring operations on steel and cast iron parts.

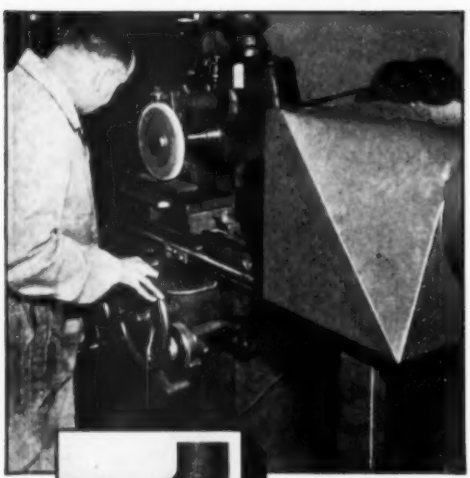
Priced low, the machine can be kept set-up for special operations with minimum machine-hour cost.

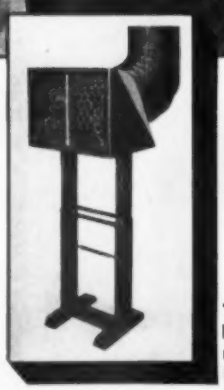
It has proved itself in the production of airplane parts, radio equipment, motor parts, instruments, light ordnance, and similar work.

The Rouse Hand Miller is an accurate, sturdy machine, the development of many years of experience in producing fine small tools and parts. Prompt delivery can be made. Write, telephone, or wire for full information.

$98.00
(Without Fixtures)
F. O. B. Chicago
Motor Extra

H. B. ROUSE & COMPANY
2214 NORTH WAYNE AVENUE CHICAGO, ILLINOIS





The coupon will bring you this new Filtaire Folder.

Filtaire
PORTABLE DUST COLLECTOR
ELIMINATES THE DANGER, EXPENSE AND NUISANCE OF DUST AND DIRT

The Filtaire Portable Dust Collector will soon pay for itself in your shop by eliminating the damage caused by the dust and dirt from grinding and polishing operations. It is particularly useful where no central dust collecting system is available. It is completely self-contained, yet fits any machine — without the use of special hoods, tank or piping.

The Filtaire is equipped with a spun glass Dustop filter which is easily replaceable, inexpensive and completely fireproof.

An added feature, particularly important today, is the fact that the Filtaire recirculates warm air — it does not expel it from the shop!

COUPON:

Please send me complete information on the Filtaire Portable Dust Collector.

NAME ..... TITLE .....

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STREET .....

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T.E.

EDWARD BLAKE COMPANY
634 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

We trimmed its waist-line

and made a better, simpler stud setter

HERE'S a brand new setter, slick as a whistle, trim as a pencil. It'll get into tight spots with ease and accuracy . . . save vital production minutes in many ways. Its small O.D. and remarkable ruggedness make it a desirable tool for either hand or power operation. Can be adjusted to any desired length of thread on stud in a few seconds. Four sizes cover a range of studs up to 1¼". You can have Morse taper shanks, hexagon, T handle, square female or T handle combination with a square female drive for use with a torque wrench. Types to fit any make of power tool. Made to customer specifications when requested.

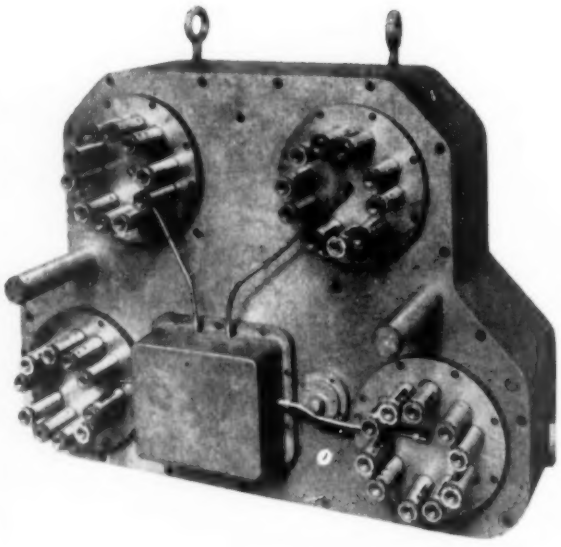
Write for Bulletin No. 101.

APEX

THE APEX MACHINE & TOOL CO., DAYTON, OHIO

Manufacturers of friction tapping chucks, quick change and positive drive drill chucks, vertical float tapping chucks, parallel floating tool holders, power bits for Phillips, slotted head and Clutch Head screws, hand tools for Phillips and Clutch Head screws, aircraft universal joints, plain and universal joint socket wrenches.

"If it's a *Buhr* Multiple Production Drill Head, it's good for 24 hour production."



Forty-spindle Buhr drilling and reaming head. For drilling and reaming holes in Aircraft Motor Cylinder. Vertical adjustment in all spindles. An oil pump provides positive lubrication.

BUHR MACHINE TOOL CO.

ANN ARBOR MICHIGAN

Specialists in Multiple Spindle Drilling, Boring, Reaming, and Tapping Equipment

Eliminate Spoilage Losses In Tapping and Reaming!

Made To Fit Any Machine

Furnished with male or female taper, straight, threaded or special shanks to fit any machine used for tapping or reaming.

Write for CATALOG

Here's How to Do It!

The spoilage of parts because of inaccuracies in tapping, or because of holes being reamed oversize or bell-mouthed, can now be easily eliminated.

The trouble, you will probably find, is due to the spindle being out of alignment with the work. The way to correct this is by using a Ziegler Floating Tool Holder—the holder that automatically compensates for such misalignment.

The Ziegler Holder always floats freely, without friction or cramping, even under the severest tool-driving strains, and takes any and all end-thrusts. This is why it eliminates spoilage losses, turning out work accurately to the finest of tolerances.

W. M. Ziegler Tool Co.
1920 Twelfth St.
Detroit, Mich.

Ziegler ROLLER DRIVE **FLOATING HOLDER** *for* **Taps** *and* **Reamers...**

DRILLING ★ REAMING ★ TAPPING

FLEXIBILITY

THIS NEW LEMAIRE MACHINE will drill flanges having 3, 6 or 12 holes on any bolt circle diameter from 5½ to 10 inches

THE UNUSUAL FLEXIBILITY of this machine recommends itself to manufacturers of crankshafts whose large volume production is divided into comparatively small runs of many different models.

The three spindles, spaced in a circle 120 degrees apart, can be moved in or out from center to any diameter from 5½ to 10 inches. Indexing of head makes possible the drilling of flanges having 3, 6, or 12 holes.

For drilling and reaming, spindle head movement is controlled by hydraulic circuit which allows rapid advance, coarse feed, fine feed, and rapid return.

Tapping is accomplished by disconnecting slide from hydraulic cylinder and using star handle to feed taps into work.

Four speed transmission provides wide range of speeds for drilling and tapping.

Thus, drilling, reaming, and tapping are all possible at one setting.

A special fixture at the right can be set up for any model crankshaft.

Because of its remarkable flexibility, this machine makes an ideal compromise between a single spindle setup and one having fixed spindle drill heads requiring individual fixtures for each piece of work. On this machine, setups for short runs are easily made and production is considerably increased over single spindle operations.

How it happened to be designed

THIS MACHINE was designed as a result of a problem that was brought to us by a prominent crankshaft manufacturer. He was drilling, reaming, and tapping on a radial drill. Because these operations were performed on a single spindle machine he felt his production was limited. The machine illustrated and described here shows how we licked the problem for him. Not only was his production stepped up considerably, but a great saving in labor hours was also achieved.

The designing and building of this machine is only one of the examples of the many diversified problems that are daily occupying our attention.

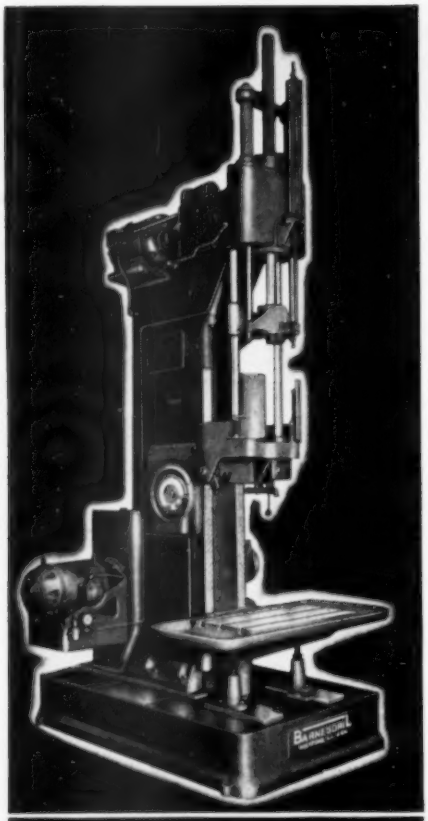
If you have any problems of production capacities of machines, let us help you work them out. We invite discussions with your engineers.

BUY WAR BONDS

LeMaire TOOL & MFG. CO.

2659 S. TELEGRAPH ROAD ▲ DEARBORN, MICHIGAN

ENGINEERS AND BUILDERS OF PRODUCTION MACHINES



BARNESDRILL No. 307 Standard Honing Machine . . . adaptable to many jobs.

Use This Machine for
LOW, MODERATE or HIGH PRODUCTION HONING

Standard BARNESDRILL Honing Machine Can Be Tooled to Fit Your Needs . . .

The standard basic design of the BARNESDRILL No. 307 Honing Machine is such that it permits a wide variety of tooling set-ups to fit different individual requirements. You can use it as a single spindle machine with stationary fixture for honing one cylinder at a time. If your production is moderate, the machine can be provided with indexing fixture using one or more stations. Further, multi-spindles can be provided for honing two or more cylinders simultaneously.

Hydraulic expansion and contraction of hones, as well as hydraulic spindle reciprocations, contribute further to the versatility of this machine. Can also be arranged for standard and automatic honing tools.

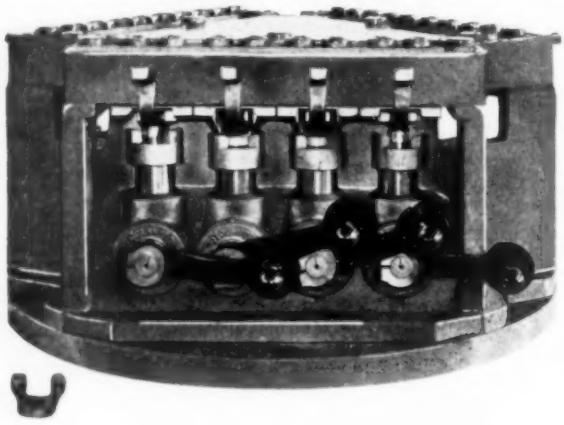
Consult our engineers as to the best honing and tooling method for your specific job. Send part prints and production requirements for complete analysis and recommendations . . . no obligation.

Honing 6-cylinder motor blocks with single spindle machine and indexing fixture.

FREE HONING DATA: Included in this booklet is a complete description of the *honing process* with specifications and data covering the entire line of BARNESDRILL Honing Machines. Write for your copy today. Ask for Bulletin No. T-148.

Barnes Drill Co.

848-71 CHESTNUT ST. ROCKFORD ILLINOIS, U.S.A.



THREE STATION INDEX FIXTURE FOR DRILLING HOLES IN UNIVERSAL JOINT YOKE. PARTS ARE CLAMPED AGAINST TOP PLATE IN ORDER TO CONTROL THE DEPTH OF MACHINED HOLES.

»» DESIGNERS ««
»» BUILDERS ««

ALL TYPES OF HOLDING FIXTURES FOR MACHINE SHOP PRODUCTION

MANUFACTURERS OF STANDARD SWARTZ DRILL JIGS AND FIXTURE LOCKS

WRITE FOR CATALOG 238M

SWARTZ TOOL PRODUCTS CO., INC.

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Cleveland—J. W. Mull, Jr.
Indianapolis—J. W. Mull, Jr.
Milwaukee—Geo. M. Wolff, Inc.
Chicago—Ernie Johnson

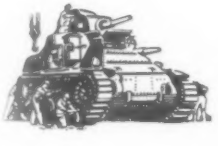
Canada—Hi-Speed Tools, Ltd., Galt, Ont.
St. Louis—Mill Supply & Mach. Co.
Beverly Hills, Cal.—Criterion Tool Sales
Houston—Engineering Sales Co.

Oneida, N. Y.—W. F. Himmelsbach
Pittsburgh—J. W. Mull, Jr.
Toledo—J. W. Mull, Jr.
Philadelphia, Pa.—Morgan Tool & Equipment Co.

for VICTORY---

Tools

must be kept fighting around the clock on the American home front!



Conservation . . . careful maintenance . . . periodic inspection . . . are terms familiar to you in your attempts to prolong the life of critical tools. But are salvaging and reconditioning of worn tools measures you have overlooked?

How many worn tools have been thrown into your scrap pile — broken drills and files, chipped cutters? Those tools may be put back to work if properly reconditioned. Our engineers are skilled in solving just this sort of problem. Let them show you how to return these shop casualties to the Battle Line of Production.

A COMPLETE RECONDITIONING SERVICE FOR TOOLS

EASTERN CUTTER SALVAGE CORPORATION, 30-32 LITTLETON AVE., NEWARK, N. J.
Chrome Plant • MASTER CHROME SERVICE, INC., 5709 HERMAN AVE., N. W., CLEVELAND, OHIO

HANDY ANDY says:

"'THE time has come,' the Walrus said, 'to talk of many things; of ships and shoes and sealing wax, of cabbages and kings' ". Which means that, for the nonce, I'm going to subordinate personalities and chit-chat to a few serious thoughts.

It occurs to me, among other things, that too much burden is placed on an incoming A. S. T. E. president by requiring that he appoint national committee heads immediately after induction. A better way would be to make appointments during the interval between March and October, confirming at the Semi-Annual.

That way, the president would have a working organization to start with, and could make selections deliberately rather than against pressure of time. Also, incumbent committee heads would know who their successors would be, and could work with them to get started. Also, the Executive slate and the committee set-up could be published in two issues of The Tool Engineer, thereby, obviating tiresome repetition.

The suggestion has the merit that the entire organization would function the smoother for the change.

▲ ▲ ▲

Another thought is that our vice presidents, rather than the president, should be elected by popular vote. Then, the president should step up to the chair in order of position. There are various valid reasons for the proposal, which is a compromise between the present set-up and an evident membership desire for popular election.

Personally, I've watched the evolution of this A. S. T. E. over a period of years, and have come to the conclusion that our presidents will function the better for a period of training in the Exec. Com'tee before assuming the chair. And when they've had that training, it should accrue to the benefit of the Society.

For example, I've seen Ray Morris develop, as Director, 2nd. and now 1st. V. P., and because of that experience—and personal qualities — he should make a judicious and constructive president. The same holds true for Doug Burnside. Doug is progressive, shows nice discernment and good judgment, and should grow along with us.

▲ ▲ ▲

Of course, the foregoing applies only to presidential, or vice-presidential, candidates. Other members of the Executive Committee were best appointed by the Directors. In this connection, one of the most important appointments is that of executive secretary.

Hence, it is a position in which the office should seek the man, not the man the office. And, unless the incumbent proves a total flop (an unlikely choice) a year is too short a time in which to pass judgment on his work. It takes at least that long to master details of organization.

Personally, I'll pay my regards to Adrian Potter who, I believe, has not only justified the confidence of his sponsors but has quietly gone about cohering the Society. **By his works shall ye know him.** Well, take this in the spirit written; as you know, I've a habit of boosting where a boost is deserved. Anyway, I'm speaking (figuratively) as a member, and the individual member is still the most important unit in the Society. Let's not lose sight of that.

▲ ▲ ▲

Sometime back in '41, I outlined a tentative plan for post-war reconstruction, a bridge with which to span the coming gap between wartime and civilian production.

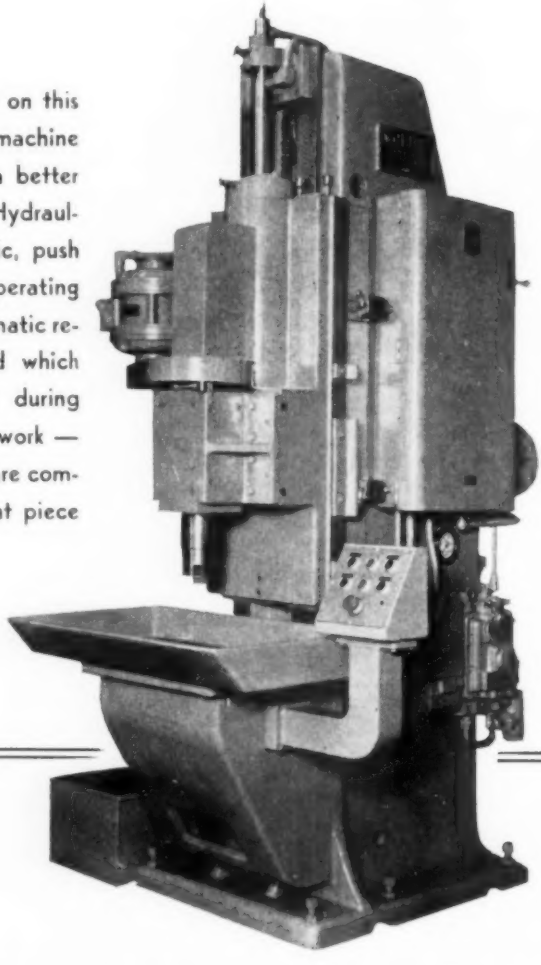
The only response was some condescending criticism that the plan was "a mere palliative", that the answer to our post-war economy was a socialistic state.

Well, we were heading hell-bent in that direction until the passing of the 77th. Congress; now, we may veer a bit to starboard, choosing a happy medium between extremes. Anyway, I guess I was too soon, like other ideas first broached in **The Tool Engineer** and

(Continued on page 162)

MORE AND BETTER TANKS!

Parts precision bored on this Moline No. 113FB machine are used in making a better U. S. armored force. Hydraulic feed — Automatic, push button controlled operating cycle — Moline automatic retracting boring head which prevents tool drag during withdrawal from the work — All of these features are combined in this, efficient piece of equipment.



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MOLINE TOOL COMPANY

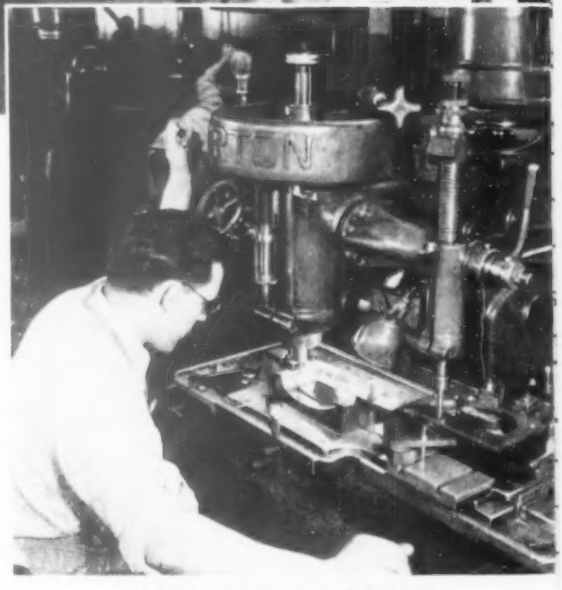
Moline, Illinois **"Holehog"** **Established 1901**

GORTON Equipped TOOL ROOMS

HOW SPECIALIZED TOOL ROOMS HAVE *Standardized with* GORTON

MACHINES *Matched Equipment* ACCESSORIES

"Made for Each Other"



TO INCREASE *Accuracy and Output*

Where "*performance of the first machine determines selection of the second,*" a large manufacturer of molded products uses Gorton Super-Speed Milling Machines for producing and duplicating molds, and accidental jigs and fixtures for plastic molding.

This Gorton standardized installation is typical of many similar. A glance at the above photo shows the predominance of Gorton Machines. Closer inspection of this modern, efficient tool room, generally regarded as one of the finest and best equipped in the plastics industry, discloses that it is completely outfitted with Gorton time-saving Accessories—Vises, Circular Tables and Cutting Tools, etc.—a "Matched Equipment" installation, setting new standards of efficiency for high-speed spindle jobs.

Gorton Super-Speed Precision Machines and Accessories are increasing production and improving accuracy in Tool Rooms and Production Plants throughout the country. Perhaps they can also help you secure better results.

FREE DATA AND ENGINEERING SERVICE

Our engineers will be glad to make suggestions and recommendations on your high-speed milling, duplicating and pantograph work without obligation. Send for our complete catalogs covering all types of Super-Speed Vertical Milling, Duplicating and Pantograph Engraving Machines. Ask for complete set of catalogs.

ONE JOB IN BRIEF

TYPICAL of one of the many operations performed in the tool room shown above, is the machining of a cavity of a section of mold for producing plastic handles. A brief outline of the job is as follows:

MACHINE—Gorton 9-J Vertical Milling Machine.

PART—Section of Mold for producing plastic handles.

MATERIAL—Crucible Steel Co. CSM #2.

CUTTER—Right hand cut; right hand spiral $\frac{3}{4}$" end mill.

OPERATION—Machining out cavity of section for plastic handle. Molding section and master fastened on top of Duplicator Table.

FEED—In this case the feed and speed, which naturally must be varied, are controlled by the operator.

CUSTOMER SAYS: "Through the use of the Gorton Machine, it is possible for the operator to cut very close to the required dimensions, thus reducing the amount of hand finishing to the minimum."

GEORGE GORTON MACHINE CO.

1322 RACINE STREET, RACINE, WISCONSIN, U.S.A.

50 Years SPECIALISTS IN ENGRAVING, DIE MAKING AND SUPER SPEED VERTICAL MILLING

which needed only time to click.

Now, post-war reconstruction is a live issue, and leading industrial concerns are tentatively if not actively planning for the economic competition that will come with the signing of armistice.

I believe that the A. S. T. E. should take an active part in the reconstruction program, not for the prestige that would accrue, but for the good we may do. Besides, we may as well have a hand in shaping the future we (or our children) are going to live in. I'd like some constructive criticism.

▲ ▲ ▲

You know, we humans have a lot of mistakes to erase, a lot of prejudice to shed (and convictions to clinch) as we struggle along toward civilization. Perhaps the unfortunate peace treaty of Versailles, with its equally inopportune juggling of political divisions, may have had no material bearing on the present conflict.

There's just no accounting for the driving urge of zealots or for the ambitions of egomaniacs. Yet, even these cannot sway nations to mutiny unless there be mass dissatisfaction with existent conditions, and some valid cause for that unrest. Even then, they must either arrogate or be given autocratic authority before they can plunge a nation into war.

Without debating Germany's possible justification for war, there is far more valid ground for the belief that the goal sought — economic independence — could have been achieved through peaceful negotiation. Nobody except the dictators wanted war, and of these one — Stalin — had evinced a desire for peace.

▲ ▲ ▲

This war, then, is a grand finale of a series of colossal mistakes, not the least of which was the tacit consent of the democracies to the rapes of Ethiopia and Republican Spain. It wasn't the threat of communism that prompted the Franco revolt, but fear of mass enlightenment as half of Spain sought to throw off the yoke of illiteracy and poverty.

There weren't 300 communists in all of "leftist" Spain, but there were thousands of engineers, teachers and other "missionaries" come to teach the Spaniards the ways of social-democracy. And there is no connection whatsoever between that and communism, unless it be an inclination to freedom of thought.

It is not fear of communism, per se, that inspires minority opposition to all-out aid to Russia, but the fear of independent thinking as 170 million people soar toward mass literacy and, with it, mass education.

As a nation, we are not concerned with Russia's political policies or alleged godlessness, but with her heroic defense of the principles of freedom which we ourselves espouse.

Let us restore the scale of proportion on which our own country was patterned. Victory we want, and victory we'll have, but with it, let there be effected a Renaissance of human thought and human creation. Let the peoples of the world achieve intellectual independence and we'll have no more of the hates that are contributory causes of war.

Hate, as differentiated from contempt, is begotten of fear, but, we do not ordinarily fear or hate that which we understand. Let us, then, grow in mutual understanding.

●

MATERIAL SUBSTITUTION HELPS CANADA RAISE WAR OUTPUT

In an effort to achieve a war production of $3,700,000,000 this year, Canada is seeking the cooperation of engineers and workers in developing methods of materials conservation in metal working industries.

The Canadian program is designed to increase the substitution of non-critical metals, and speed the simplification of war products design. A notable result is the reduction of steel alloys in one tank from 100 types to 28 types.

Another example of the results of this program is revealed in the substituting of zinc for brass in percussion fuses. At the current rate of production, one manufacturer will save 43,605,000 pounds of brass and 427,800 pounds of bar steel; and 12,510,000 pounds of zinc will be substituted. This one conversion releases 18 machine tools, saves 996,780 man-hours, and reduces costs $5,696,000. Such measures, it is believed, will lower Canadian war production costs by $155,000,000 a year.

LET'S THROW OUT THESE MANPOWER PIRATES

• In almost any plant you'll find that a few manpower pirates have slipped in and started their dirty work of cutting down production and increasing manpower needs. The "pirate" that steals manpower from you, right in your own plant, may be a machine that needs redesigning, an inadequate production control system, or that too common thief of manpower and production efficiency—the outgrown and inefficient plant layout.

• In these days when we have the greatest reason for doing our production best, we must all watch out to see that men and machines are used to the maximum of their possibilities. That's why so many great American companies (Douglas Aircraft, Boeing, Curtiss-Wright, Allis-Chalmers, Fairbanks Morse, etc.) call in La Salle engineers.

• La Salle can help to ease your manpower and production headaches. Today you may simply need extra engineers to aid your own overburdened staff. Tomorrow, you may need a complete job of tooling, processing, designing, and even the men to get and set up the machines and start production. No matter what your production problem, La Salle will be glad to discuss it with you at no cost. Just write, wire, or phone us today.

PRODUCTION AND MANAGEMENT ENGINEERING

LA SALLE

A LA SALLE DESIGN

▶TOOL DESIGN ◆PLANT LAYOUT

LA SALLE DESIGNING COMPANY

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USE THIS CARD when answering advertisements, to obtain specific information on problems or when you desire a company representative to call.

Write in square, number of item describing one catalog wanted ➔ ☐

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(Sec. 510, P. L. & R.)
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NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

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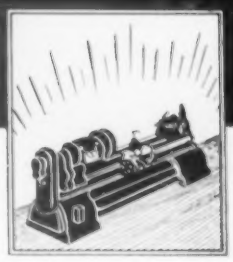


NEW HOLLOW MILL (J77)

Designed for machining a round trunnion on each end of a turbine blade and at the same time face the blade to length, a new hollow mill was recently announced by LeMaire Tool & Manufacturing Company of Dearborn, Michigan.

In the center of the machine is an index table which has four special toggle clamp fixtures. The hollow mills on the two sides operate on horizontal slides, each slide carrying two auxiliary slides on which the cutter heads are mounted.

In operation, the cycle starting button of the machine is pushed after the loading operation. This turns the table 90 degrees around toward the left where the roughing is done. The station directly opposite the operator is not required for this particular work.

The finishing operation is completed at the fourth station. As the operator loads each piece, work is proceeding on the pieces already in the fixture. As soon as the horizontal slides are in position, the cutter heads advance rapidly toward the work and go into feed hollow milling a trunnion on each end of the slide blade stock.

At the end of the milling cycle, the cutter heads retract on rapid return. When the cutters are in the back position, the horizontal slides move back to the end of the machine to complete the cycle.

Auxiliary slides are pivoted and equipped with protractor and Vernier scales. This is said to permit the heads to be fixed so trunnions can be hollow milled at any angle.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

DOUBLE END CENTERING MACHINE (J78)

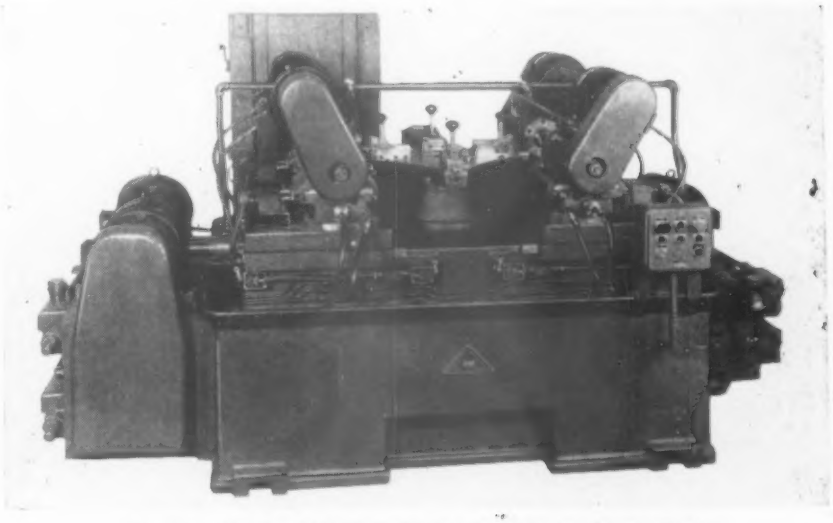
A new machine, designed to center both ends of large work such as gun forgings, was recently announced by Kent-Owens Machine Company of Toledo, Ohio. With this machine tool, the work is freely suspended in slings and is adjusted into position by two davits, each equipped with a chain hoist.

The manufacturer claims that the suspension of the work in slings permits locating the centers in the approximate center of gravity of the piece. It is said to be an improvement over the old method of obtaining a geometric center.

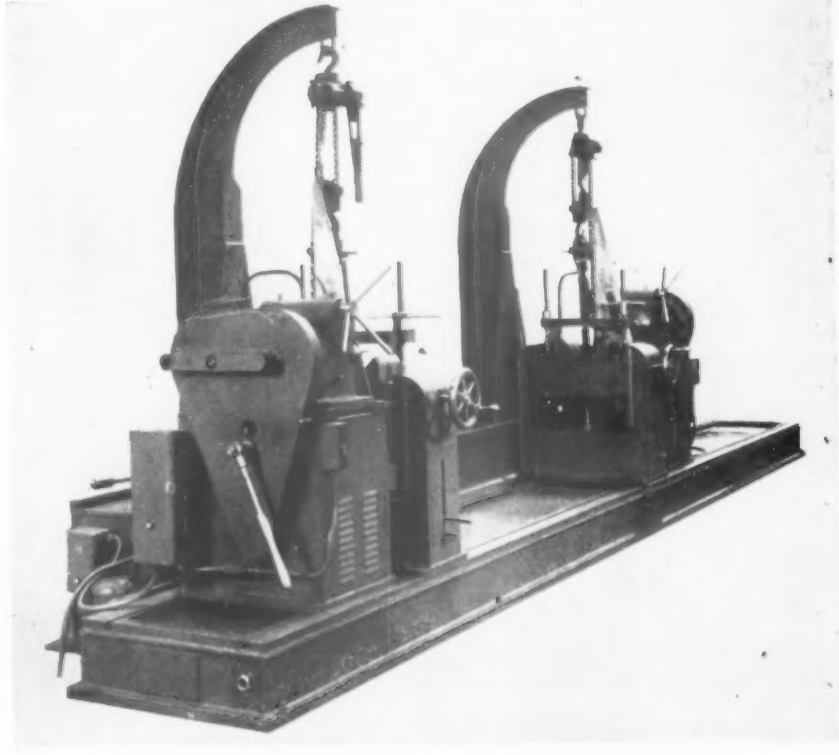
The davits, work supports, and centering heads are adjustable along the base for proper setting to suit a given job. The machine as illustrated will accommodate work up to 14 inches in diameter and up to 19 feet in length. However, it is claimed that simple modifications can be made to handle work of larger diameter and greater length.

While the work is suspended in the slings, a vertical line is scribed across each end by means of a square resting on a surface plate and located against a centering gauge above the sling. The work is then slightly rotated in the slings by means of a chain wrench, and another vertical line is scribed, and so on. The intersection of these lines indicates the center of gravity.

(Continued on next page)



The New Hollow Mill Recently Designed by Le Maire Tool
Does two operations on turbine blade at the same time.



New Double End Centering Machine Made by Kent-Owens
Suspension of work in slings said to be leading feature.

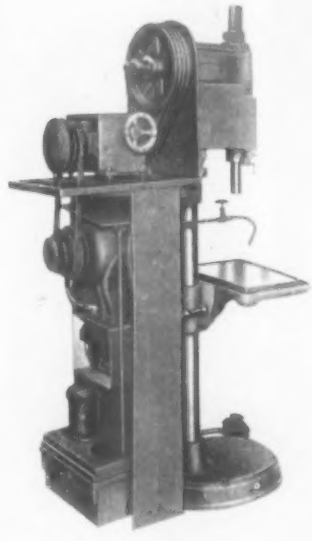
NEW TAPPING MACHINE (J79)

Said to have a capacity of 1¼ inch N. C. in steel, the new tapping machine recently announced by The Cleveland Tapping Machine Company of Cleveland, Ohio is called the model DB and has 16 speeds.

A heavy duty lead screw type machine, it is dual push button controlled for either automatic or manual operation. The dial indicator for adjusting the reverse control is said to be so sensitive that the vertical travel of the spindle can be held to within a .005 of an inch limit.

Said to fit into aircraft, tank, and shell production work, this machine is said to have controls that are so synchronized that the rotational motion of the spindle is reversed within a maximum of a quarter turn of the spindle at the moment of reversal.

The speed range is through a four speed transmission and four step V drive pulleys. Final drive is through a four groove sheave, into which a sensitive clutch is incorporated for tap protection. The range of speeds is from 45 to 300 rpm.



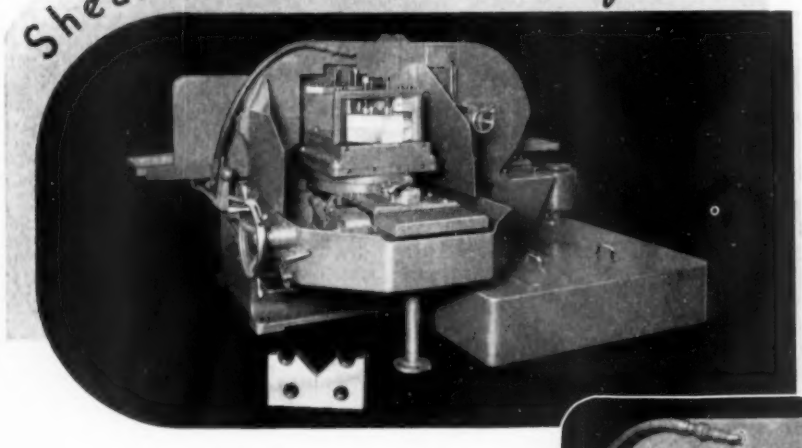
New Cleveland Tapping Machine
Is a lead screw type machine.

The accompanying illustration shows the machine with the housing removed to show its construction. It is equipped with a 3 hp motor, oil pump and tank and No. 4 MT spindle.

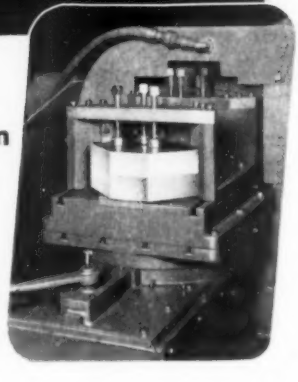
INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

Shear blades that *shear forever-*



or *almost*-- due to this
GARDNER-GRINDING operation



IN a large forge shop, the alligator-shear blades seen here, must be resharpened from time to time, as their cutting edges become worn and dulled.

The No. 96 – 30" Gardner Hydraulic Surface Grinder provides a quick, convenient means of accomplishing this operation. The entire grinding head travels, the work table remaining stationary, which makes it possible to use an indexing type of fixture, as shown, with the operator loading one station while the other is presenting a shear blade to the grinding wheel. Constant, steady operation — no time lost in fixturing.

On the shear blades shown in the "close-up", one edge and two large side surfaces are ground in 50 to 60 minutes, complete.

On maintenance jobs like this, or on production work, the GARDNER No. 96 — 30" SURFACE GRINDER is ideal.

WRITE FOR COMPLETE DATA ON THIS MACHINE!

GARDNER-GRIND YOUR *Flat* SURFACES

GARDNER MACHINE COMPANY
442 East Gardner Street • • • • Beloit, Wisconsin, U.S.A.

BENDING AND BEVELING MACHINE (J80)

A new hydraulic bending and beveling machine was recently announced by the Hufford Machine Works Inc., 315 Diamond Street, Redondo Beach, California. It is said that this machine has been especially designed for handling extruded rolled and flat strips of all shapes and many materials.

The machine consists of a stationary table carrying the forming die and two simultaneously actuated arms which are hydraulically operated and hinged to the table.

The bending is accomplished by stretching the extrusion between the two hydraulic cylinders and wrapping or bending the strip around the die while under tension. The machine has a work capacity of 12 to 200 inches in length, 7 by 7 inch maximum size cross section, and approximately 3 square inch maximum cross section area.

HEATING BY ELECTRICAL INDUCTION (J81)

The use of a process of electrical induction in the heating of a propeller blade shank for two important forming operations is said to save approximately four-fifths of the time formerly required. This propeller shank is heated by the TOCCO process, a method perfected by the Ohio Crankshaft Company of Cleveland.

Preparatory to the first forming op-

(Continued on page 168)

. . But his customer got the Gauges in time!

Recently a Purchasing Agent handed a Distributor's salesman an order for a set of Gauges—normally a stock item with any well-equipped Jobber.

But the local factories are loaded up with precision work—first it seemed Gauges would be hard to find, finally the salesman admitted none were to be had

"We haven't quit trying," he reminded the P. A.—from his own office he called a responsible manufacturer 600 miles away. "Yes," replied the Gauge man, "we have some of those sizes and will ship today."

This incident is typical of the unusual services that many Mill Supply Distributors are rendering their customers during the Emergency.

When the Distributor billed the job, he added $6.00 normal gross profit. Then he paid the Telephone Company a $4.00 toll, leaving $2.00 for himself. Still he feels he is away ahead because one of his standard policies is to say "thanks—sure we'll take care of you on every order."

You like to do business with firms like that and so do we. Years ago we began appointing them *our* Distributors—and *your* close-at-hand source of supply for Cle-Forge High-Speed Drills and Peerless High-Speed Reamers throughout Industrial America.

ARMY NAVY

Awarded May 22, 1942
Superseded July 13, 1942

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49TH STREET
CLEVELAND

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

30 READE ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 650 HOWARD ST. SAN FRANCISCO
6515 SECOND BLVD. DETROIT · LONDON - E. P. BARNUS, LTD. - 35-36-37 UPPER THAMES ST., E.C.4

ARMY E NAVY

Awarded August 8, 1942
★

"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU

eration of swaging, the propeller blade shank is heated by this process. It is mounted on a movable rack at the front of the 100 K.W. TOCCO machine as shown in the accompanying illustration. The tubular shank section at the base of the blade is then moved forward until it is surrounded by the heat inductor coils of the unit.

The control button is then pushed and the shank is heated to approximately 1700 degrees Fahrenheit in 150 seconds. When the correct temperature is reached, the blade is hooked to an overhead spring balance crane and is conveyed to a large forging machine for the swaging operation.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

After two welding processes, a thorough inspection, and a lathe machining operation, the blade is heated a second time in the TOCCO unit for 210 seconds to a temperature of about 2200 degrees Fahrenheit. When the proper heating is attained, the crane conveys the heated piece to adjacent upsetting equipment where the heated shank is formed in a three pass set of dies to increase the wall thickness of the shank.

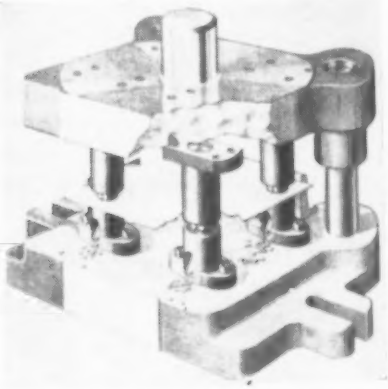
100 K. W. TOCCO Machine
Speeds forming operations.

The manufacturer claims that previous methods of heating took longer and that it was hard to judge when the desired temperature had been reached. That this unit can be located near the swaging and upsetting equipment, is said to be another advantage.

PUNCHING UNITS (J82)

New Wales CD punching units for use in conventional die sets have been recently announced by the Strippit Corporation of North Tonawanda, New York. These new units are sets of punch and die units. The manufacturer states that the punch unit half contains a punch with a pilot, holder, stripping spring, and guide. A holder with a slug clearance chute and a die make up the die unit half.

Each unit is self-contained and independently mounted to either punch or die shoe. Thus it is said that this eliminates time losses by making every punch or die holder quickly accessible



New Wales Punching Units
Sets of punch and die units.

for changing individual punches and dies to instantly replace broken or dulled parts.

There are two methods of mounting these units into a die set. One is the

(Continued on page 170)

OUR CREED . . . YOUR
GUIDE TO SATISFACTION!
We'd rather make a few products WELL than a score of products of indifferent quality. That is why we have specialized for 20 years in making circular metal cutting saws, drills, combination center drills, and reamers.
By thus concentrating our efforts we can streamline our production and maintain exceptionally high standards of quality without correspondingly increasing prices.
The steadily growing demand for Circle "R" Products is convincing evidence that our creed is your guide to satisfaction. Even our enlarged plant, containing 20,000 square feet of floor space, is taxed to the limit to meet delivery requirements.
CIRCULAR TOOL CO., INC., Providence, R. I.
CHICAGO • PHILADELPHIA • NEW YORK • DAYTON • CLEVELAND • SYRACUSE
INDIANAPOLIS • DETROIT • ST. LOUIS
CIRCLE "R" TOOLS
Made by Perfectionists
R

FOR LOWER UNIT COST ON SMALL PARTS PRODUCTION

Urgent war needs have stepped up the demand for small parts to such an unprecedented degree that large turret lathes are being tied up when they are sorely needed for heavier work. The Logan No. 830 Hand Screw Machine was developed to break this bottleneck. Engineered and built to exacting specifications, it is capable of accurate, continuous production. With a capacity of ⅝-inch round bar stock, it turns out parts with the same speed and precision as that of the larger machines. And, because its cost is low by comparison, unit production costs are further lowered.

Logan

A NAME TO REMEMBER WHEN YOU THINK OF LATHES

SPECIFICATIONS

1 Swing Over Bed, 10"

2 Bed Length, 43⅛"

3 Spindle Hole, $^{25}/_{32}$" Capacity, ⅝"

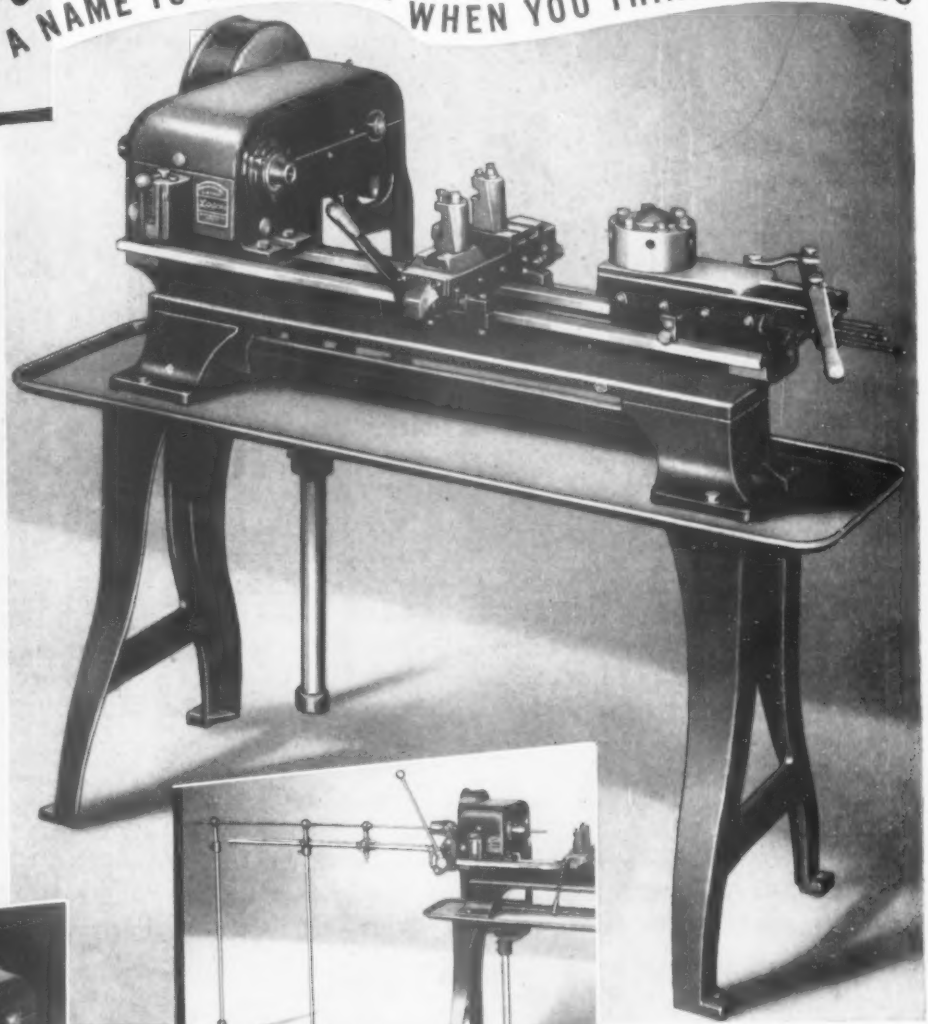
4 Preloaded Precision Ball Bearing Spindle Mounting

5 12 Spindle Speeds, 30 to 1450 R.P.M.

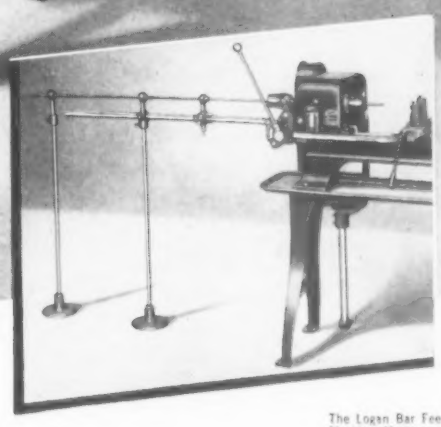
6 Cross Slide Stroke, 3¼"

7 Six Position, Automatic Indexing Turret

8 Stroke of Turret, 4¼"



NO. 830 LOGAN ⅝" CAPACITY HAND SCREW MACHINE



The Logan Bar Feed is offered as an accessory for the No. 830 Hand Screw Machine. Maximum capacity: ⅝" round bar stock. Maximum stroke: 2 inches. Patented safety cam action operates bar feed and locks collet at one operation

The Logan Speed Collet Chuck is made to fit the No. 830 Turret Lathe, or other lathes with a 1 ½" x 8 thread spindle nose. Capacity: ⅝" round work. Positive, accurate squeeze grip operated by hand wheel. No keys or wrenches.

LOGAN ENGINEERING COMPANY • Chicago, Illinois

customary way of mounting die sets by mounting these units directly to the punch and die shoe. The other method is said to be unique in that the units are mounted on templates which slide into position and are bolted to the shoes. The accompanying illustration shows a cutaway view of four CD units and back gauges mounted on a conventional die set.

These units are said to be used in either punch presses or press brakes to punch holes from 1/16 to 1⅛ inches in diameter in metal up to 11 gauge. The compact design of both punch and die holder is claimed by the manufacturer to allow unusually close center to center hole punching.

NEW THREAD MILLERS (J83)

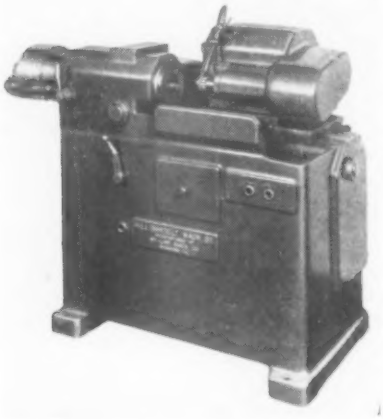
The accompanying illustration shows one of two models of a newly designed thread milling machine recently introduced by The Hill-Bartelt Machine Company, 229 South Church Street, Rockford, Illinois.

The machine illustrated is a single-purpose one, set up for production runs on a specific job. The second machine is a general-purpose one, adjustments permitting change of set-up for a wide variety of work.

Said to be of modern design throughout, these machines are fully motorized with all driving elements enclosed. Another feature is said to be the fact that the machines require only 42½ by 28 inches of floor space. The spindle is 40 inches from the floor and the same main elements are used on both machines.

Said to be well suited to the threading operation on the nose of 75 mm. shells, the single-purpose machine can be made up for cutting either right hand or left hand external or internal threads, using a multiple type thread mill. Work up to capacity of 3 inches diameter is held in an air-operated collet chuck.

The general-purpose machine will cut threads from 5 pitch to 32 pitch, up to 9 inches in length with a single cutter and up to 2 inches in length with a multiple cutter. The cutter head has a tilting adjustment for aligning the cutter with the helix angle of the thread. Two types of feed are furnished, either cam feed or lead screw. A tailstock is included and a controllable cross feed is said to permit the cutting of pipe threads or partially tapered threads.



New Hill-Bartelt Thread Miller
Single, general purpose models.

HEAVY DUTY SOLUBLE OIL (J84)

Said to speed production and reduce costs, a new oil recently developed by Standard Oil Company of Indiana provides the finish, tool life, and cooling that formerly required more than one oil.

The company claims that in addition to requiring a cutting oil to give high finish and long tool life, many jobs demand also the maximum cooling usually obtainable only with a water emulsion type coolant. They claim that such specifications can be met with the one heavy duty soluble oil.

(Continued on page 172)

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

Now, Rods and Bars From Our Own Extrusion Mill
. . . To Better Serve America's War Production

A new bronze extrusion mill—one of the largest in the Middle West—is another Ampco facility to better serve American industry in its war production program. Just one of several divisions of Ampco Metal, Inc.—from it today comes a steady stream of rods and bars. In a few months, heavy walled tubing suitable for bushing stock will also be available.

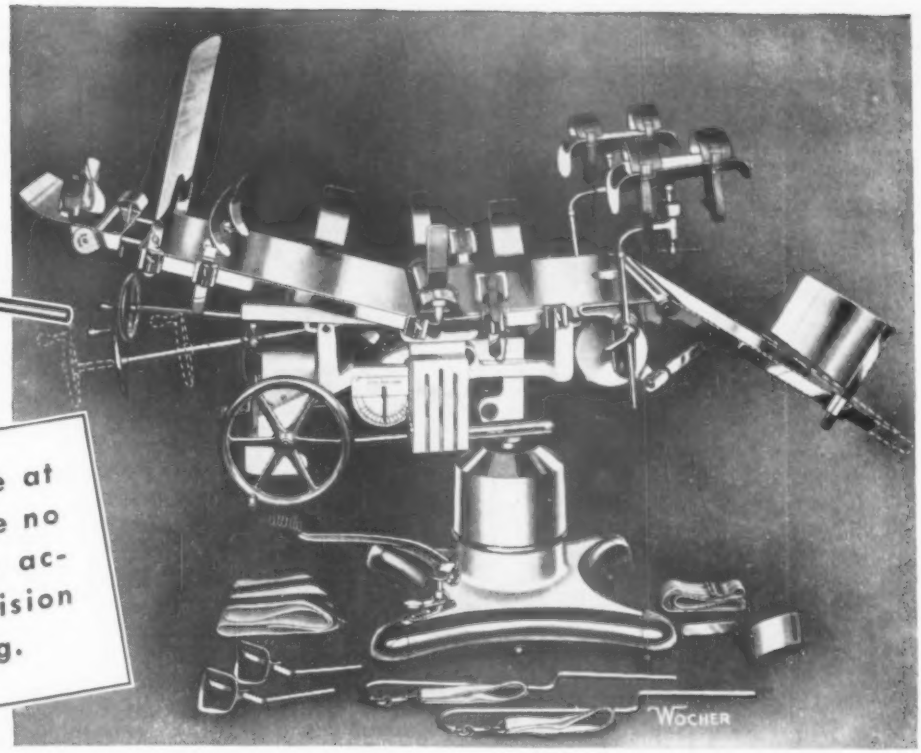
The extrusion process assures wonderfully dense and clean metal, together with better physical properties—important for parts subject to abuse and wear. The increasing demand for extruded Ampco alloys made the new plant necessary, and it is now filling a long felt need. All standard grades of Ampco Metal and some Ampcoloy bronzes are available in extruded form.

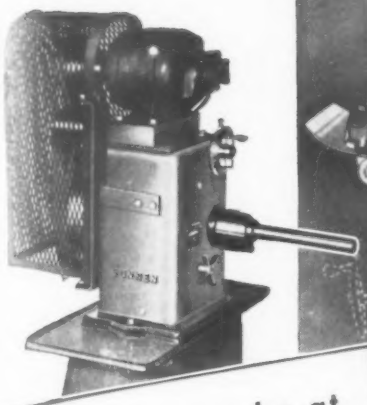
Consult with Ampco engineers for detailed information regarding extruded bronze and its applications. Write today!

AMPCO METAL, INC.
DEPARTMENT TE-2 MILWAUKEE, WISCONSIN

AMPCO METAL

THE METAL WITHOUT AN EQUAL





Where life may be at stake there can be no compromise with accuracy and precision manufacturing.

SUNNEN PRECISION HONING

assures accurate, dependable operation of Wocher Major Operating Table

"Strict alignment maintained between two holes."

Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Inner Bearing Ring "Accurately removes last 'tenth' of stock."

Hardened Steel Gears. Honing used to remove any distortion after hardening and to selectively size the gears to uniform diameters.

Airplane Engine Parts accurately honed to a super-smooth finish.

The hydraulic cylinder and valves of this famous operating table used by the Army and Navy are *precision honed* by the Sunnen method to obtain accurate, dependable performance.

This is just one more example of the hundreds of ways in which the Sunnen "MA" Precision Hone is serving industry in our all-out war effort.

Put Sunnen Honing to Work in Your Plant

The "MA" is *fast!* Its accuracy conserves vital war materials, assures absolute interchangeability of parts. Low in cost, economical to operate.

Wide Range — handles any internal diameter from .185" to 2.400".

Easy To Operate — workers in 'teens — even girls — can be trained to handle jobs in "tenth's" in a few hours.

No Fixtures Needed — work held in hands. Relieves big internal grinders for other jobs.

Let a Sunnen Engineer Check Your Jobs!

We'll gladly have a Field Engineer check your grinding or honing jobs in your plant with our "MA." Or write for free bulletin giving complete information.

Sunnen Awarded Army-Navy "E"
for its production of honing equipment being used throughout industry in the manufacture of vital war materials.

SUNNEN

SUNNEN PRODUCTS COMPANY, 7932 Manchester Avenue, St. Louis, Missouri
Canadian Factory: Chatham, Ontario

According to the company, the new product contains an effective amount of special compounding other than that required to give good emulsion characteristics. It says that the oil is stable in storage, mixes easily, does not gum machines or work, possesses anti-rust properties, and is non-injurious to workmen's hands. In addition it is said to have no harmful effect on machine lubrication where used as recommended by the manufacturer's cutting oil engineers.

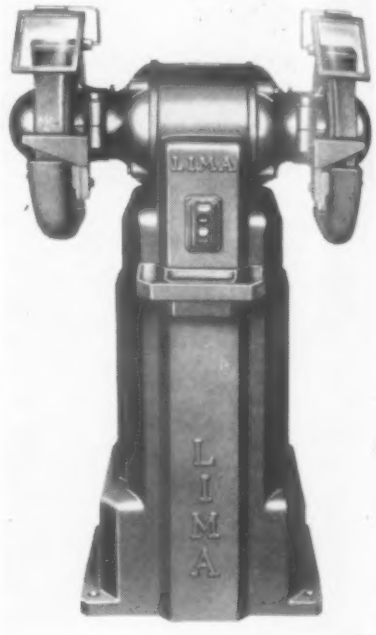
INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

NEW TOOL ROOM GRINDER (J35)

A new machine, recently announced by the Lima Electric Motor Company of Lima, Ohio, is called the Lima Tool Room Pedestal Grinder. It is designed as a 2 or 3 hp unit, 1800 rpm, 2 or 3 phase, A. C., 220, 440, or 550 volts.

On both models the wheel size is 12 by 2 inches and the wheel arbor diameter is 1¼ inches. The model 24S has a distance of 20¼ inches between the wheels while model 25S has a 24 inch distance. The height to the arbor on both the models is 39 inches while the overall height is 45¾ inches.



New Lima Tool Room Grinder
Wheel size is 12 by 2 inches.

Other features of this model are said to include a totally enclosed Lima motor, push button motor control with overload protection, dust tight heavy duty ball bearings, and improved safety wheel guards. Also mentioned by the manufacturer is the adjustable tool rest, the combination lift out water pot and tool tray, and the wheel guards which are equipped with exhaust vents.

SCALE FOR BLIND WORKERS (J36)

A new scale, said to be designed to help blind workers weigh materials and parts accurately, was recently demonstrated in New York by the Toledo Scale Company of Toledo, Ohio. Called the "Audio" scale, it operates on the airplane radio beam principle.

It gives an audible signal "A" as long as the scale shows under the correct weight, the signal "N" if it registers over, and an unbroken buzz when it registers the correct weight. In war plants, the scale has such uses as weighing out specific amounts of powder for fuses and mica for radio mechanisms.

In operation, alternating current of 1000 cycles flows in tuneable double branch circuit, with an earphone coupling transformer common to both branches. A motor-driven contactor switches the current alternately to the two branches so that the intermeshed "A" and "N" pulses are applied respectively to the minus and plus fixed plates of the scale indicator balancing condenser. At the desired weight, both signals are heard synchronized.

(Continued on page 174)

★ Established Nineteen Hundred and Thirty-Two ★

SYNCRO
BLASTS THE PANZERS!

SYNCRO is making parts for submarines, bombers, tanks, guns, etc. — to help blast the panzers — bomb the Axis and torpedo enemy ships. SYNCRO furnishes precision machine tool parts to large and small war factories where accuracy is vital to the war effort. SYNCRO workers are proud to be Soldiers of Production on the Machine Front. SYNCRO welcomes the opportunity to handle your special engineering and production problems now — and after the duration.

Complete manufacturing facilities for development of precision machine tool parts — special tools — fixtures — production parts — plug gauges.

SYNCRO DEVICES inc.
3265 Bermuda Avenue Ferndale, Michigan

MANUFACTURERS OF PRECISION MACHINE TOOL PRODUCTS

THE MOST IMPORTANT CONTRIBUTION TO METAL CUTTING SINCE THE ADVENT OF CARBIDE

FULLY PROVEN—EFFECTIVE UP TO CARBIDE CUTTING RANGE—NOT A SUBSTITUTE FOR CARBIDES—USE WHERE YOU CANNOT USE CARBIDES

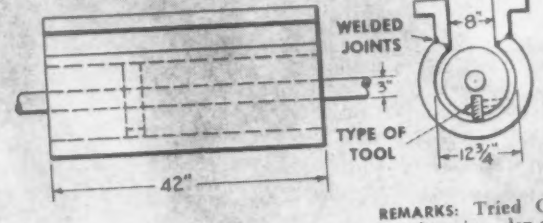
What Is TANTUNG? Tantung is a hard, tough, non-ferrous alloy. Its red hardness is far above that of any steel. It is strong and tough and unlike other non-ferrous cutting alloys, Tantung contains tantalum carbide. This adds materially to hardness and imparts a self-lubricating action which minimizes chip wear or "cratering."

What TANTUNG Does? Tantung cuts rolled, forged or cast steel, cast iron, aluminum, brass, copper, bronze or any material that can be machined.

Increased Machine Productivity! Under most conditions Tantung tools operate at double the speeds recommended for high speed steel. Tantung permits heavier cuts, heavier feeds, more pieces per grind. All these factors contribute to doubling and trebling production on boring, turning, and facing operations.

Change to TANTUNG! It is easy to change to Tantung tools from high speed steel. Standard tools are available which fit most tool posts and holders, and no special grinding equipment and wheels are necessary. The conventional HSS tool practices apply to the effective application of Tantung tools.

A SPECIFIC EXAMPLE OF TANTUNG TOOL PERFORMANCE



SOLID TOOL BIT (⅝" bit in boring head).
MATERIAL—18-8 Stainless Steel and welded joints.
MACHINE—20-year-old Lucas Boring Machine.
ADVANTAGE OF TANTUNG—Unable to keep any other tool from breaking at the welded joint.

	TANTUNG Rough	TANTUNG Finish	OTHER CUTTING MATERIALS
S.F.M.	240	346	All other tools tried failed by breaking at the welded seam after only a few revolutions.
Feed/Rev.	14	40	
Depth of cut	⅜	.010	
Pieces per grind	1	1	

REMARKS: Tried Carbides, H.S.S., and a competing cast alloy and got nowhere in a day and a half. Tantung tool bit completed the job in 3 hours, with a mirror-like finish.

FREE—*SEND FOR TANTUNG PERFORMANCE DATA BOOK*

TANTUNG • ECONOMY • ALL PURPOSE • CUTTING OFF • SPECIAL TOOLS • SOLID TOOL BITS • MILLING CUTTER BLADES

VASCOLOY-RAMET CORPORATION

NORTH CHICAGO, ILLINOIS • DISTRICT SALES AND SERVICE IN PRINCIPAL CITIES

IN CANADA: Carbide Tool & Die Company, Ltd., Hamilton, Ont.

MACHINE FOR DRILLING AND REAMING (J87)

Built by Snyder Tool Engineering Company, 3400 East Lafayette Street, Detroit, this machine is used to drill and ream a hole in the exact center of a boss on an aircraft part, the operation being performed before and after the part is welded into an assembly.

The first of the two special fixtures employed in this operation can be seen in the foreground of the accompanying illustration and is used for drilling the sidewalls of the fork-like flange. Equalizing clamps are used to balance the stock so as to bring the drill hole in the exact center of the boss.

After being drilled, this flange is welded to a tubular member and the O. D. of the tubular member is used for locating the assembly in the second fixture.

This second fixture is equipped with a pivoted 2-hole bushing plate. One set of bushings is for core drilling the holes on this assembly and the second set is for line reaming.

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Drilling and Reaming Machine
Two special fixtures employed.

Work cycle is as follows: A bank of flanges is drilled, using the first fixture which is replaced by the second fixture. These flanges are then welded to the tubular member, placed in the second fixture and core drilled and line reamed. A quick change tool chuck is said to permit the fast exchanging of drill, core drill, and reamer.

ADJUSTABLE HOLE CUTTER (J88)

Introduced a few weeks ago on the Pacific Coast, this new 3 blade hole cutter, manufactured by the Robert H. Clark Company, 3424 Sunset Blvd., Los Angeles, is said to be in use at many western shipyards and aircraft plants.

New Adjustable Hole Cutter
"Stick" is not necessary.

These Clark hole cutters are designed for use in electric drills, pneumatic motors, drill presses, lathes, milling machines, or wherever Morse Taper or

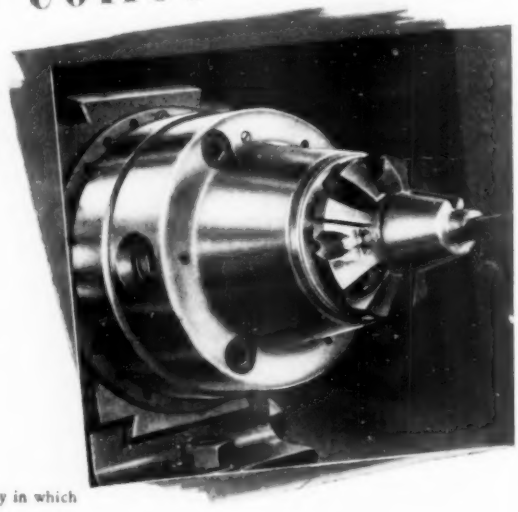
(Continued on page 176)

nose-type collet chuck...

simplifies set-up

for ACCURATE

milling of pinions



Here's just one example of the way in which precision nose-type collet chucks can be quickly and easily adapted to handle work that might otherwise necessitate special equipment. The chuck is mounted on the dividing head of a standard milling machine and the work is the milling of teeth to close limits of accuracy on bevel pinions of special design. Collets have been machined to provide clearance for the milling cutters and, by changing to collets of different capacities, a variety of sizes of pinions can be handled.

Especially important, in a set up of this kind, is the ability of the chuck to maintain consistent accuracy in centering of the work, a feature assured by the uniform full-length bearing grip of the collets in Cushman precision nose-type collet chucks.

Every day, Cushman Engineers are helping chuck users to solve special chucking problems presented by the many new types of work called for in armament production and to conserve and utilize to the full chucking equipment already available. Feel free to call upon us for the help you may need. The Cushman Chuck Company, Hartford, Connecticut.

CUSHMAN

A World Standard for PRECISION

3 NEW WAYS

to speed output . . .

1 **"MX" WHEELS** combine light stock removal with finishing and polishing action. They are free-cutting and are to be used dry on any portable machine. For breaking down sharp edges on gears etc., finishing and polishing out-of-the-way places.

CARBORUNDUM PRESENTS 3 NEW "WEAPONS FOR PRODUCTION"

KEEPING pace with the war program, Carborundum has developed many new and novel coated abrasive products—Weapons for Production to speed output, insure high finishes and lower costs. Here are three of the most versatile and useful! They are particularly adapted for finishing and polishing out-of-the-way places on airplane engine parts and similar metal work.

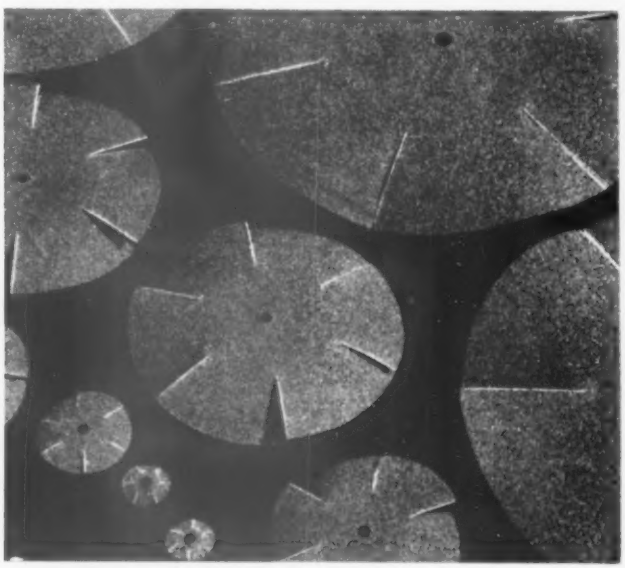
1. ***"MX" Wheels*** are fabricated from cotton fibres intimately intermingled with Aloxite Brand Aluminum Oxide or Carborundum Brand Silicon Carbide grain. They are made in six grades of hardness.

2. ***Cloth Cartridge Rolls*** are made in diameters from $\frac{3}{8}$ to 1 inch of tightly wound, glued strips of metal working abrasive cloth. Rolls are from 1 to 3 inches in length.

3. ***Multi-Slotted Discs*** afford a time-saving, cost-saving way to burr and polish the edges of holes in metal work. Produced in all necessary grits, in diameters from $\frac{1}{2}$ to 6 in.

CARBORUNDUM ABRASIVE PRODUCTS

2 **CLOTH CARTRIDGE ROLLS** can be mounted on a spindle and used on a portable tool for finishing hard-to-reach surfaces. As abrasive surface wears down, cloth backing can be torn off to expose fresh layer of abrasive.



3 **MULTI-SLOTTED ABRASIVE DISCS** simplify the job of removing the burr and producing the true radius required on holes. Used in a portable power tool, the disc "cones" backward, finishing only the hole edge. When two discs are mounted together back to back, they can be used to finish both edges.

THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

REG. U. S. PAT. OFF.

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

(Carborundum and Aloxite are registered trade-marks and MX is a trade-mark of, and indicate manufacture by, The Carborundum Company)

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straight shank tools can be used. It is claimed that they will cut clean holes ¼ inch to 4½ inches in diameter in metals, plastics, hard fibers, pressboard, or wood in thin sheets or ¾ inch thick.

It is said that no finish grinding or filing is required by the holes cut with this tool. The accompanying illustration shows the cutter being driven by a portable air motor. An "Old Man" or "Stick" is not necessary, it is claimed. The tool will not catch when going through the hole if it is used properly.

NEW MILLING MACHINE (J89)

A new model milling machine is now under production by Index Machine and Tool Company with sales and distribution handled through Blank and Buxton Machinery Company of Jackson, Michigan. The new patterns provide for heavier column, knee, saddle, and table.

The machine is said to be sensitive enough for jobs requiring end mills of approximately ⅛ inch diameter and sturdy enough to take cuts with cutters up to ¾ inch diameter in tool steel.

Blank and Buxton Milling Machine
Excels in cavity and contour work.

Claimed to be excellent for cavity and contour work, this machine has a spindle which runs in precision ball bearings packed in a special grease. It has 3¼ inch quill travel with power feed. Spindle head swivel is 90 degrees right or left.

Another feature of this new machine is the table which is fitted with cross and longitudinal. It is said that a piece 8 by 16 inches can be worked — milling, drilling, and boring (straight or at angles) all in one setting. Available speeds are fast enough for small end mills and slow enough for boring holes up to 3 inches in steel.

When Time is Short and Labor is Scarce

You Can Do More With a Dumore

Touch up dies, sharpen cutting tools, clean up welding points and castings with Dumore Hand Grinders. Do hundreds of everyday jobs . . . in tool rooms, on production lines . . . do them quickly, accurately, economically. Dumore Hand Grinders are precision built; every rotating part is dynamically balanced to eliminate vibration, reduce operator fatigue, provide finger-tip balance and control. Available in seven types and sizes, with speed and horsepower to handle any off-hand grinding job. Call your nearest distributor, or write

THE DUMORE CO., DEPT. 223-B, RACINE, WISCONSIN

DUMORE No. 9

Big and powerful, yet easy to handle. Weighs 7½ lbs., has ¼ h. p. motor, idles at 15,500 r.p.m. Forced ventilation, convenient trigger switch in end handle.

DUMORE No. 10

Most popular model, widely used in production. Has 1/10 h.p. motor, idles at 22,000 r.p.m., weighs 47 ozs. Maximum power with minimum weight.

Dumore

PRECISION GRINDERS

Savage Tool's New Set of Gage Blocks
81 blocks from .050 to 4.00 inches.

NEW GAGE BLOCKS (J90)

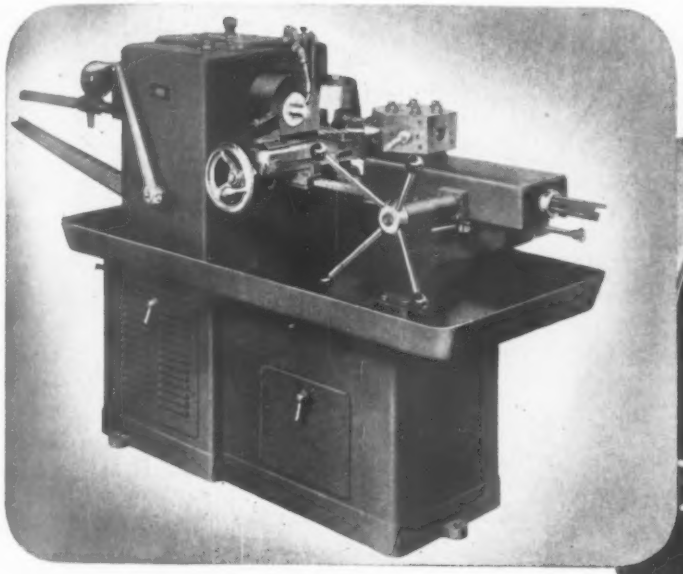
A line of gage blocks called the Do-All Master Gage Blocks has recently

(Continued on page 178)

This part produced in ONE forming cut by the

OSTER NO. 601

"RAPIDUCTION" TURRET LATHE



The part illustrated is one of numerous examples of heavy forming cuts obtained with the SIMPLIFIED Oster No. 601 "RAPIDUCTION" Turret Lathe, equipped with WORM DRIVE.

The hardened and ground steel worm, like the spindle, is mounted in ball bearings. A smooth, even flow of power is transmitted through a bronze worm wheel to the spindle. This smooth flow of power makes possible exceptionally heavy forming cuts with absence of chatter. (For high speed work on small diameters and non-ferrous materials, a DIRECT DRIVE is provided. Spindle speeds up to 3000 R. P. M. are obtained.)

The 6-station turret is now equipped with AUTOMATIC INDEXING. Price of complete machine is unchanged (Under $2000 without tools, F. O. B. Factory). The form below offers a convenient way to obtain full details QUICKLY. *Use it!*

No Time Out to Celebrate Our 50th ANNIVERSARY 1893-1943

OSTER

THE OSTER MFG. CO., 2063 E. 61st ST., CLEVELAND, OHIO, U. S. A.

★ O. K. Oster. We're interested in the No. 601 machine. ( ) Send Catalog No. 601. ( ) Ask your nearest distributor to see us at once. (Check either or both of above requests.)

NAME .....

ADDRESS .....

CITY ..... STATE .....

been announced by the Savage Tool Company of Savage, Minnesota. Being produced in quantity at the present is a standard set designated as Set 400. It consists of 81 blocks which range in length from .050 inch to 4.00 inches.

These gage blocks are produced in AA grade (accuracy .000002 inch), A grade (accuracy, .000004 inch), and B grade (accuracy .000008 inch). Each block is said to be extremely accurate in length, has its measuring surface lapped to a flatness of less than the quarter wave length of light, and is produced with a mirror finish. It is claimed by the manufacturer that these factors enable the blocks to be wrung together in combination, thus enabling the user to secure practically any dimension in steps of .0001 inch, from .1000 inch to 12.00 inches.

In the accompanying illustration the inspector is checking a 4 inch micrometer. It shows the gage blocks in the mahogany case that is supplied with them.

The manufacturer states that precision optical measuring instruments are used to check the accuracy of every gage block produced. This equipment is also available to users for rechecking their gage blocks after they have been in use.

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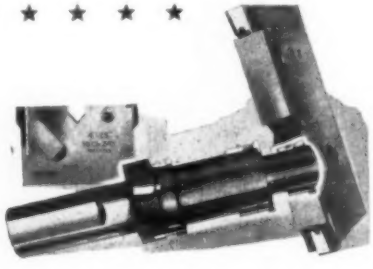
★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Doing their Part in Wartime Production



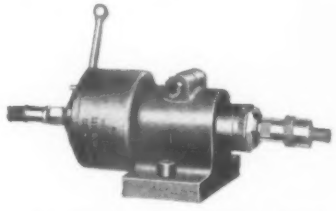
McCROSKY Block-Type Boring Tools are engineered to save time and material. An improved centralizing device insures accurate centralization of the block in the bar. Cutter blocks can be removed without removing the centering key. A thrust screw behind each blade provides quick and sensitive adjustment. And positive blade lock is provided by McCrosky's tested pin-and-screw lock.

Full Details in McCrosky Bulletin 16-B.

PNEUMATIC GRINDER (J91)

This stationary grinder, manufactured by M-B Products, 130 East Larned Street, Detroit, is said to have been engineered to fill a field where a fast bench unit can be used most advantageously. It has three stages of power and a speed of 55,000 rpm.

This is model W - S. R. and is tradenamed the "Whirlwind." The spindle is fitted with a ½ inch diameter hole and permits the use of a standard ½ inch abrasive stick. The manufacturer claims that the speed is ample for excellent grinding without excessive abrasive wear. The end of the stick can be dressed to any desired shape and it is said to be ideal for the burring of small holes or similar burring operations when a cone shape is used.



Stationary Pneumatic Grinder
Has three stages of power.

The three stages of power for this unit are accomplished with three individual air jets that are controlled by a valve so that one, two, or three jets may be turned on at the will of the operator.

To protect the grinder from water, dirt and scale in air lines, and afford definite lubrication at all times, a ¼ inch pipe size M-B air line filter and automatic lubricator is furnished as an accessory with each unit.

SANDING MACHINE (J92)

The new Sterling 1000 electric sander has just been announced by Sterling Tool Products Company, 363 East Ohio Street, Chicago. Said to be designed to meet heavy duty requirements, this new machine has a new orbital motion sanding action that produces maximum cutting and leaves a completely smooth sanded surface on wood, composition, or metal.

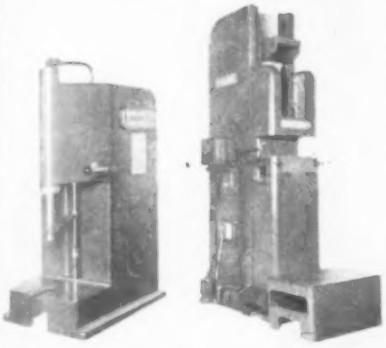
The detachable sanding pad is operated by a latch type lock and takes ⅓ of a sheet of standard abrasives. Said to be of flexible construction to permit sanding on either curved or flat surfaces, the machine will also do many lapping and polishing operations by using a felt or cloth matrix on the sanding pad.

It is powered by a 1/5 hp Universal motor which is cooled by a turbine type

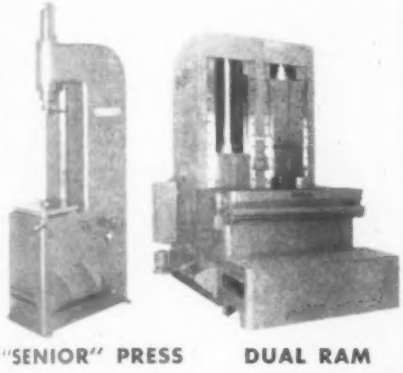
(Continued on page 180)

You CAN pick the wrong Machine

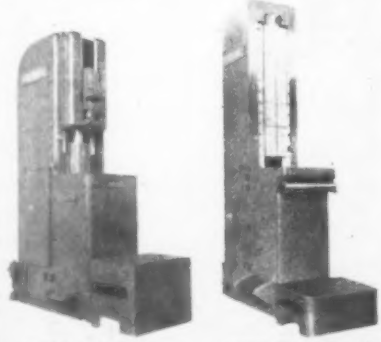
UNIVERSAL HORIZONTAL



"JUNIOR" PRESS PULL-UP



"SENIOR" PRESS DUAL RAM



PULL-DOWN SINGLE RAM

These standard Colonials come in scores of models

How to get more production with your Broaches------

3. BY PICKING THE RIGHT MACHINE FOR THE JOB

THE very flexibility of broaching machines—the variety of jobs to which each standard "Colonial" can be applied — frequently makes it difficult for the user to select the proper type of broaching machine for a specific operation or group of operations.

Proper machine selection depends primarily on three factors:

1. The nature of the job.
2. The capacity required.
3. The length of stroke needed.

Following are some hints as to selection of the best machine type for different kinds of jobs:

ROUND HOLE BROACHING: Can be handled on practically every type of standard broaching machine except those specifically designed for surface broaching. If parts are extremely large, or floor space is at a premium, a vertical machine is preferable to a horizontal type. If the operation is mainly a "sizing" job, or if the broach is not too large, a "Senior Press" may be used.

If permissible for parts to drop off the broach at the end of the stroke, and not too large to handle properly, a "Pull-up" may be used.

If the parts are too large, or if the part requires accurate locating in a fixture, a "pull-down" may be preferable.

SURFACE BROACHING: In high production, the most suitable machines are Colonial Single and Dual Ram vertical machines. If maximum production capacity is not required, a "Senior Press" may be used on light jobs. Lower production surface broaching operations may also be performed on a "Universal Horizontal" if already available. If automatic indexing is desired, a "Senior Press" or a ram type of machine should be used.

KEYWAYS: While keyways may be broached on vertical machines, it is usually best to use a "Universal Horizontal" for this work in combination with a key-way horn. This type of machine provides greater ease of loading for such work.

HELICAL SPLINES: Best performed on a "Universal Horizontal" in combination with a helical lead bar, providing maximum accuracy and ease of handling. Can also be performed on vertical machines, of course.

The above, of course, is not a complete summary and individual recommendations may differ depending on the nature of the job. As to machine capacity and length of stroke, it is always advisable to obtain the recommendation of your broaching machine and broach producer. Here the best guide is still "experience"—the knowledge acquired from tooling and studying thousands of broaching operations.

colonial BROACH COMPANY

Broaching Machines *Broaches-Broaching Equipment*

DETROIT . . . . . U. S. A.

New Sterling Sanding Machine
Has a new orbital motion.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

fan. The motor is protected from dust by a replaceable filter screen.

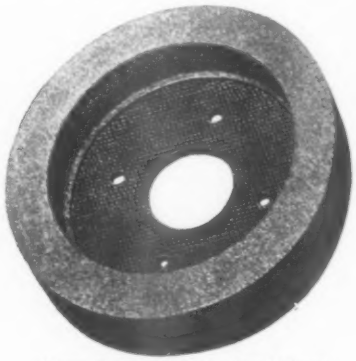
Claimed by the manufacturer to be a streamlined, balanced and counterbalanced vibrationless unit, the sander has its gears and counterpoise mechanism sealed in a dust proof cartridge type gear case. Moving parts are supported by oversize ball and needle type, plus 1 sintered bronze bearing.

GRINDING WHEEL (J93)

A new grinding wheel, said to be for use with Tungsten Carbide metals, drill points, Kenna metal, and all kinds of steel, was recently announced by The Sterling Grinding Wheel Division at Tiffin, Ohio.

This new development in grinding wheels features the fact that no steel or rubber is used and thus is said to result in quicker delivery dates. The flexibility and light weight of the new material out of which the back plate is constructed is claimed by the manufacturer to have many advantages which lengthen the wheel's life and improve its cutting action.

These new wheels are also said to be easier on bearings because of their lighter than usual weight. Necessity of returning the steel plates is eliminated.



New Type of Grinding Wheel
No steel or rubber is used.

HYDRAULIC BULLDOZER (J94)

A new 200-ton hydraulic bulldozer was recently announced by the Beatty Machine and Manufacturing Company of Hammond, Indiana. Produced originally for use in a war arms plant, this machine is said to be suited to extensive use in all heavy metal working industries.

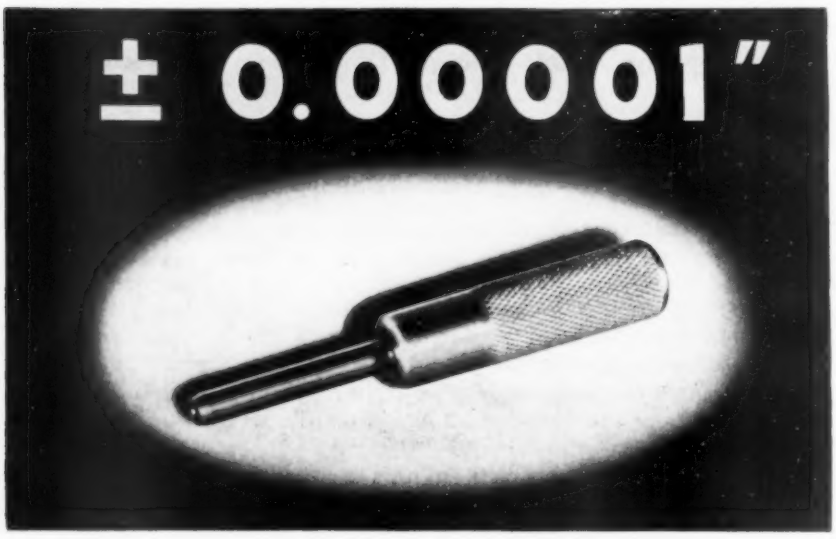
Listed among the specifications of this new machine are such features as a capacity of 200-tons, a stroke of 36 inches, a maximum opening of 60 inches, and an adjustable shut height of 14 or 24 inches.

Other features include a ram head and resistance lug, each 12 by 60 inches, a table (right to left) 60 inches, a pressing speed of 20 inches per minute, and a return speed of 60 inches per minute.

SHOP HAMMERS (J95)

A special line of metal hammers for machine shops, assembly lines, powder plants, ordnance depots, and arsenals was recently announced by the Holland Brass Works, 429 South Clinton Street, Chicago.

Hammers are cast of bronze, 85% copper, 5% tin, 5% lead, and 5% zinc. The manufacturer claims that this combination is economical, wears well, and is non-sparking. THE END.



THIS EXTREMELY ACCURATE GAGE WAS BUILT TO ORDER BY TUNGSTEN ALLOY

The tungsten carbide gage shown above, full size, is typical of special tools made to superlative accuracy by Tungsten Alloy. It is used to check the races of aircraft-engine bearings . . .is dead true on center and has a diameter tolerance of one one-hundred-thousandth of an inch. It takes good equipment and good men to do that. Why not let these machines and these craftsmen make your tools and gages?

Bulletins on Request

GET TUNGSTEN ALLOY'S PRICES ON THESE PRODUCTS

Tamaloy carbide tips • tipped tools • tipped lathe centers tipped drills • gages • Speedaloy tool bits

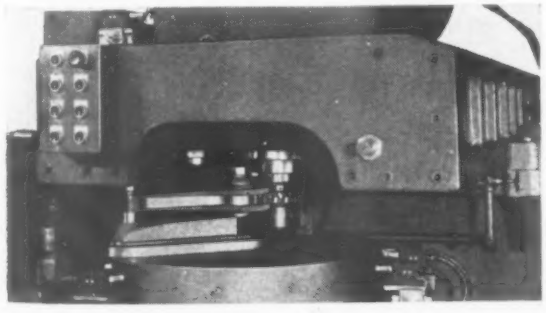
TUNGSTEN ALLOY MFG. CO. • 65 COLDEN ST., NEWARK, N. J.
Formerly Circle Tip Tool Co.
TUNGSTEN CARBIDE SPECIALISTS

Big DAVIS & THOMPSON *Roto-matics* FULLY AUTOMATIC

Speed Up VICTORY PRODUCTION

Here is another unique example of how Davis & Thompson specially designed automatic machines combine sensational production speed with finest precision to assure the safest fighting planes and best of battle weapons to hasten Victory:

This D&T high production machine has a 34" rotary table (hydraulically operated by oil motor) mounted on a sliding table of 44" movement (driven by another oil motor actuating a screw), with vertical spindle head for feed or rapid traverse forward or reverse (run by a third oil motor, through a screw).



In approximately 20 steps, automatically actuated by solenoid valve controlled limit-switches, the machine completes all the intricate rough- or finish-milling of the channel operations on connecting rods for aircraft engines . . . with speed that cuts time to a fraction of former methods . . . with uniform precision . . . conserving vital metal by reducing rejections . . . saving manpower by automatic operations, completing either job on a single setup, and simplifying inspections.

In war or peacetime, Davis & Thompson engineers boost production and cut costs with specially designed machines. You will find this organization well qualified and equipped to analyze your production and to speed output.

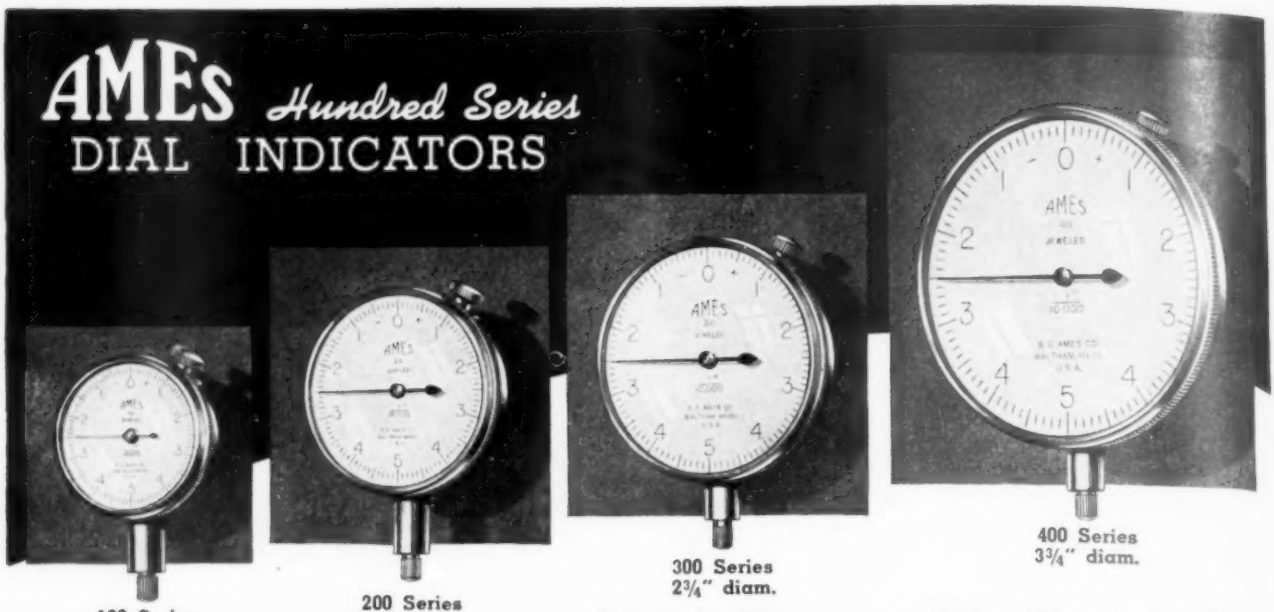
Write for copy of the "Victory Production" book.

DAVIS & THOMPSON CO., Milwaukee, Wis., U. S. A.

Buy WAR BONDS and STAMPS

D&T ROTO-MATIC HIGH PRODUCTION MACHINERY

AMEs *Hundred Series* DIAL INDICATORS



100 Series
1-11/16" diam.

200 Series
2¼" diam.

300 Series
2¾" diam.

400 Series
3¾" diam.

Entirely New . . . Alike Except in Size

A complete line of modern indicators of the latest design and with exclusive features, developed from experience gained during a half century of manufacturing only the finest instruments of their kind. Superior to all others in quality, accuracy and durability, yet they cost no more. Investigate and compare them.

Catalog No. 52 on request.

B. C. AMES CO., WALTHAM, MASS., U. S. A.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

HUNDREDS OF THOUSANDS ECLIPSE CUTTING TOOLS WENT TO WAR—IN 1942

★

MILLIONS MORE ARE GOING TO WAR TO HELP 'ECLIPSE' THE AXIS—IN 1943

★

Eclipse your war production problems with Radial Drive High-Speed Steel and Tungsten Carbide Counterbores, Countersinks, Back Spotfacers, Two-Piece Core Drills, Inserted Blade Cutters, Welch Plug Cutters, Multi-Diameter Cutters and Special Design Tools.

ECLIPSE COUNTERBORE COMPANY
DETROIT · MICHIGAN

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Mark Iron, Steel and Carbides the

Etchograph

Way

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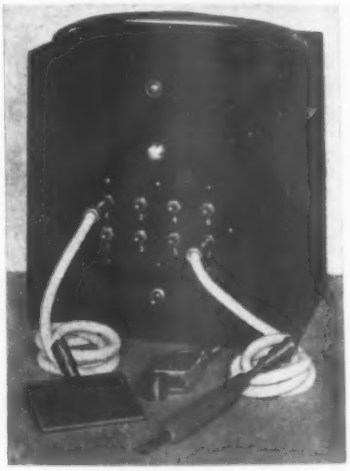
MORE THAN 3000 IN USE



NEW MODEL

Buy the Original Electric Etcher

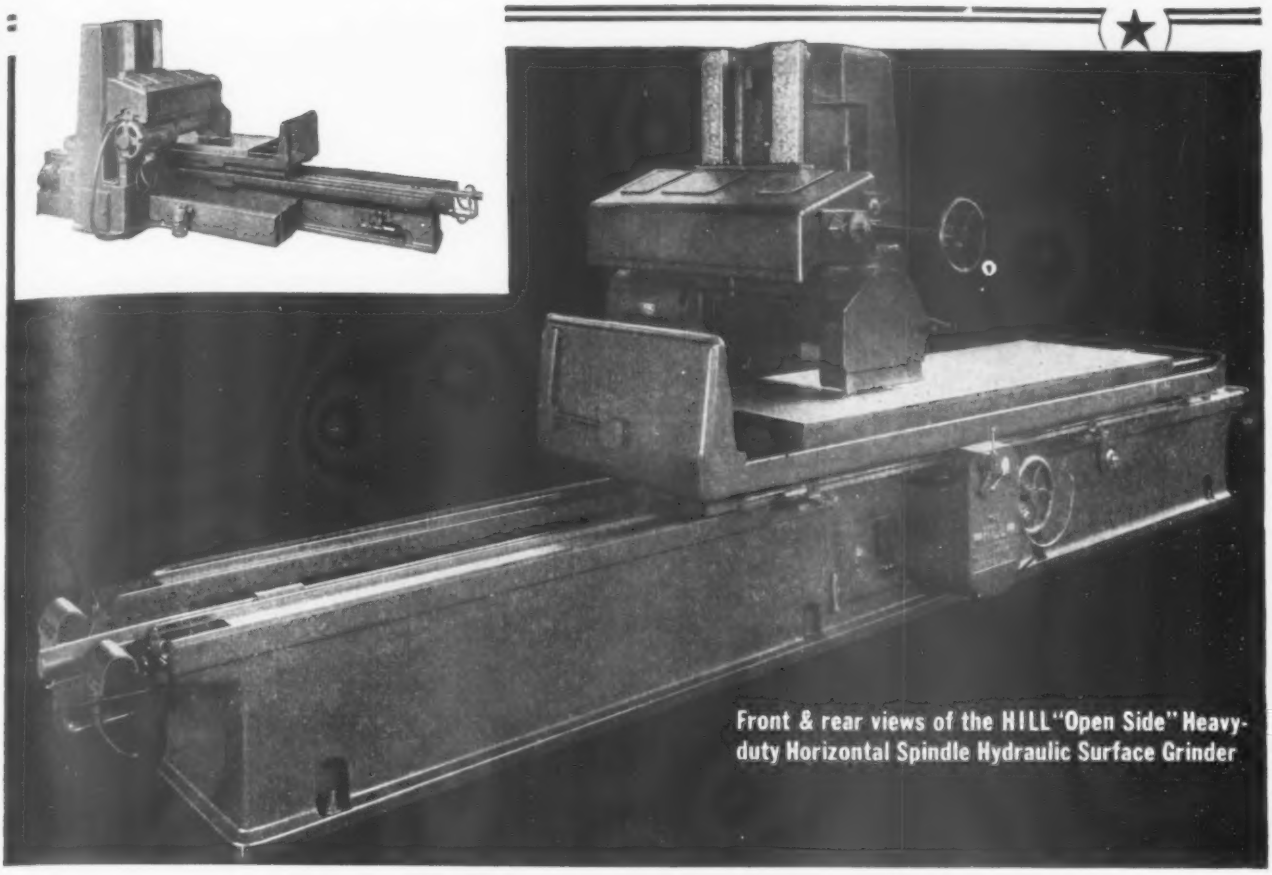
Three sizes to meet all requirements. Also a combined Etchograph and Demagnetizer.

WITH NEW ELKONITE TIP PENCIL

Mark *hardened parts*, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides — quickly — plainly.

Write for circulars and prices.

BREWSTER-SQUIRES COMPANY
54 Church Street
NEW YORK, N. Y. U. S. A.



Front & rear views of the HILL "Open Side" Heavy-duty Horizontal Spindle Hydraulic Surface Grinder

★ ★ ★ *easy to operate* —

CONTROLLED PRECISION

HORIZONTAL

VERTICAL

Today's *man power* problems make it imperative that machine tools be easy to operate so that inexperienced operators can quickly learn—yet precision work is demanded today as never before. HILL "Open Side" Hydraulic Surface Grinders hold the answer to both problems. In a remarkably short time, men transferred from non-essential industries are being trained to produce finished parts ground to close tolerances. We will gladly furnish you with names of HILL "Open Side" Grinder users in your territory—Ask THEM what THEIR HILL Heavy Duty Precision Grinders are doing, or send for Bulletin H-V-3 and be your own judge from the facts presented.

The HILL ACME Co.

6400 BREAKWATER AVE • CLEVELAND, OHIO

NEW LITERATURE . . . . . .

T.M. REG. U.S. PAT. OFF.

Of Interest to Production Executives

(631) Spring Collets and Feed Fingers

Hardinge Precision Power Spring Collets and Feed Fingers for Brown & Sharpe machines. 4 pp. Hardinge Brothers, Inc., Elmira, N. Y. This bulletin was prepared to simplify the ordering of collets and feed fingers for Brown & Sharpe machines. All necessary information is contained in three columns: (1) List Prices of different size collets, feed fingers, master collets and feed fingers, and pads for master collets and feed fingers. (2) A means to readily identify exact requirements — photographs of two different style collets and two different feed fingers. Exact dimensions and corresponding ordering numbers are beneath each picture. (3) A table showing customary use of collets and feed fingers with Brown & Sharpe Automatics and Wire Feed Screw Machines.

INFORMATION FREE

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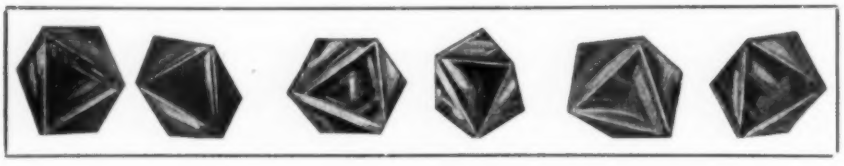


GILMORE DIAMOND TOOLS

in

WAR PRODUCTION

War Production Plants are constantly raising their standard of precision work, and, this in turn, calls for better quality Diamond Tools.

Thousands of these superior diamond tools are made and regularly delivered to our customers as promised.

We have greatly increased our diamond working machines, our gauges and other production tools, all of which enables us to extend this diamond tool service to help solve your precision grinding problems.

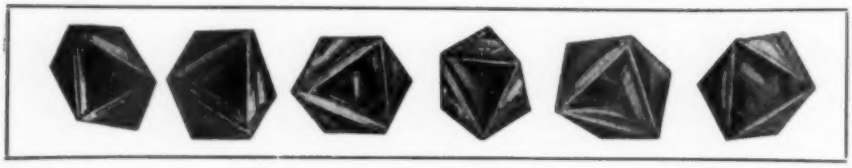
◆

F. F. Gilmore & Co.

Manufacturers of Diamond Tools

285 Columbus Ave.
Boston Mass.

2834 E. Grand Blvd.
Detroit, Michigan



(632) Thread Milling Cutters

Facts About Multiple Thread Milling Cutters. 13 pp. Machine & Small Tool Divisions, Barber-Colman Company, Rockford, Ill. Well illustrated with drawings and photographs, this direct mail piece was designed to assist the users of thread milling cutters in ordering and using these cutters for war production work. It explains in elementary terms what things are responsible for difficulty in manufacture and what may cause inefficient operation of thread milling cutters in production.

(633) Drilling Machine

Cleereman Drilling Machines. 16 pp. Bryant Machinery & Engineering Company, 400 W. Madison St., Chicago, Ill. Containing photographs and descriptions of the various Cleereman drilling machines, this new booklet describes the features of the different parts, such as the transmission, feed gear box, sliding head, etc. Specifications for the 21", 25" and 30" machines, in both round and box columns, are included.

(634) Steel Specifications

Composite Die Steel Sections. 70 pp. Ajax Steel and Forge Company, 205 Adair St., Detroit, Mich. This booklet should be of value to anyone working with steel, whether he be designing the tools or handling the material. Composed almost entirely of reference tables, it contains steel and tool steel specifications of Ford, G. M. and Chrysler; S. A. E. and Ajax specifications; and charts of weights of round, flat and square steel per lineal inch and average weight of flat steel per lineal foot.

(635) Collet Chucks

Erickson Precision Collet Chucks. 11 pp. Erickson Steel Company, 2309 Hamilton Ave., Cleveland, O. A number of improvements recently made in Erickson Chucks for open slotted collet method of gripping, are clearly outlined in this bulletin. There are descriptions of the new models, various types of equipment, actual setups plus other helpful information. Over 35 illustrations are used to acquaint the reader with all details. General dimensions and specifications for the various models and a price list are included.

(636) Speed Lathe

Colborne Speed Lathes. 1 pp. Colborne Manufacturing Company, 157 W.

(Continued on page 186)

A Missing Link is Now Made

IT IS
THE HEAVY-DUTY
50" x 10" SWING
SPLINE & KEY WAY
MILL
Built by

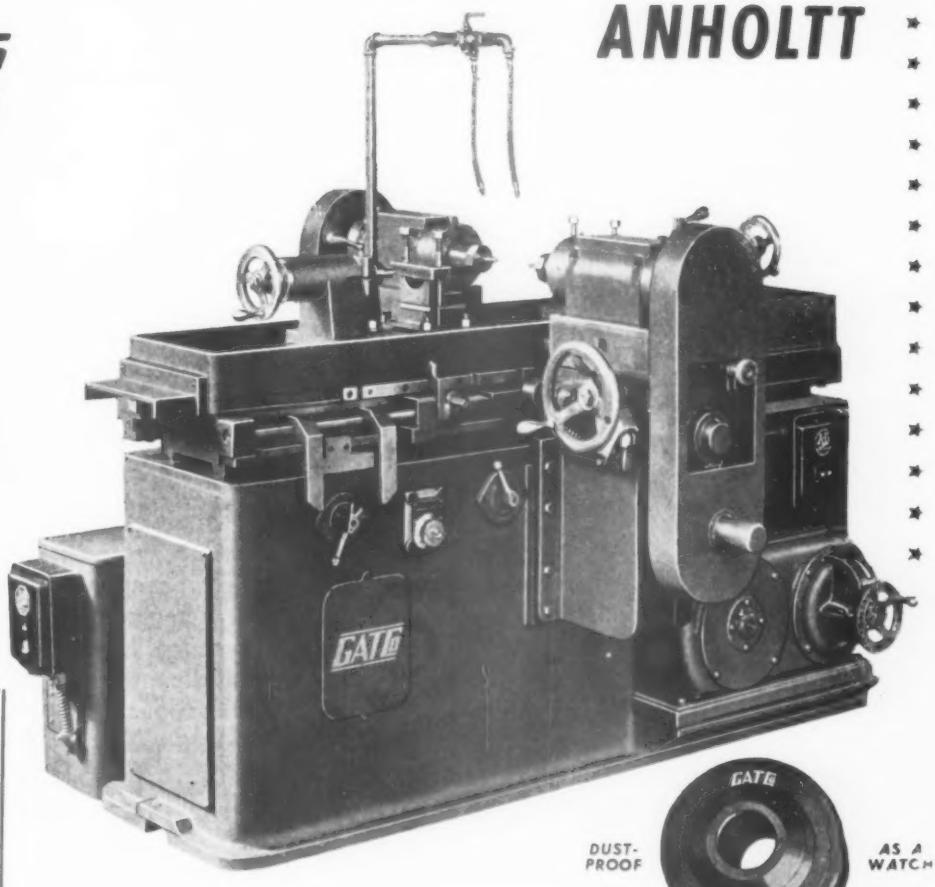
GIERN & ANHOLTT

GATCO

TWIN HEADS FOR DOUBLE KEYING

HYDRAULIC FEED

CUTTERS RANGING FROM 3/16" to 1" DIA.



DUST-PROOF AS A WATCH

Builders of
DIAMOND & CARBIDE
PRECISION BORING
EQUIPMENT
and
THE FAMOUS
GATCO
ROTARY JIG &
PILOT BUSHING

Write us for particulars

GIERN & ANHOLTT TOOL CO.

1308-12 Mt. Elliott Avenue • Detroit, Michigan, U. S. A.

Division St., Chicago, Ill. This circular describes a heavy duty High Speed Finishing Lathe for polishing, grinding, burring, lapping and final operations on gears, dies, gages, small parts and long rods. Specifications are listed.

(637) Special Cutting Tools

A. C. E. for Special Cutting Tools. 4 pp. American Cutter and Engineering Corporation, Warren, Mich. This circular illustrates 33 and lists more than 50 of the various types of cutting tools which this manufacturer is prepared to make. It contains a few pertinent facts on how each tool is made to customer's blueprints.

(638) Angle Tool Attachments

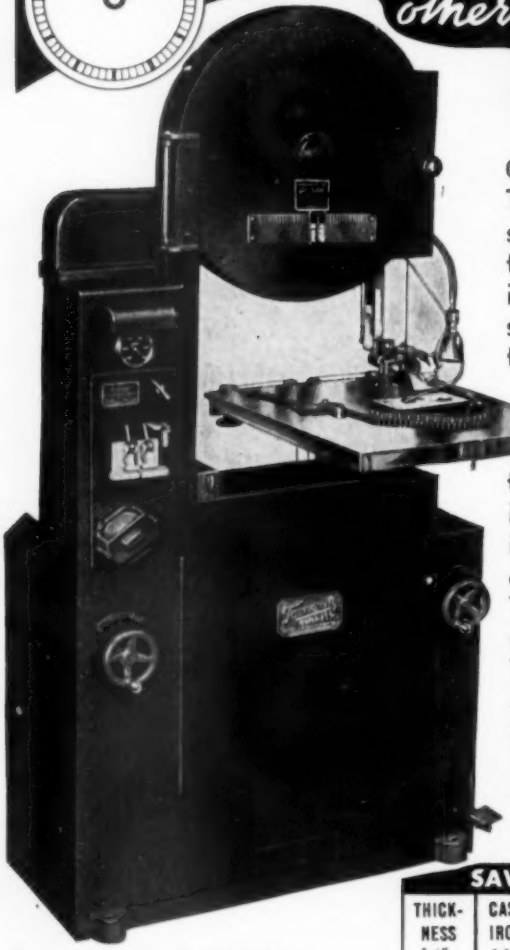
Can You Afford to Gamble with Production Delays? 16 pp. Invincible Tool Company, 611 Empire Bldg., Pittsburgh, Pa. Photographs and drawings of angle tool attachments for portable drills for operations in close corners and narrow spaces are the main features of this catalog. Complete dimensioned drawings of a few of the special tools made by this company for National Defense jobs should be of interest.

(639) Finishing Operations

Minnesota Mining and Manufacturing Company, St. Paul, Minn., Department NR1242. A new booklet just released by this company contains information about a new technique of grinding, finishing and polishing that is said to offer the finishing departments of manufacturers a faster method and insures increased production. There is a complete description of the method, which consists of the use of a backstand idler unit, utilizing a newly perfected segment face contact wheel and surface coated abrasive belts.

TANNEWITZ DI-SAWS

Do in **MINUTES** *jobs which otherwise require* **HOURS!**



Conservatively estimated TANNEWITZ DI-SAWS save an average of 70% of the time and cost involved in making inside and outside cuts on dies, shoes, templates and the hundreds of other operations, including filing and polishing, to which these machines are ideally adaptable. In many instances they are turning out work in as little as ONE-TENTH of the former time required.

To expedite production and cut costs, by all means investigate the tremendous possibilities these machines offer in tool and die making and other applications.

SAWING SPEEDS PER MINUTE

THICKNESS	CAST IRON	COLD ROLLED	TOOL STEEL	HI SPEED STEEL	HI CHROME HI CARBON
¼"	16"	9"	5"	2⅜"	1½"
½"	8"	4½"	2½"	1⅛"	¾"
1"	3½"	2¼"	1¼"	½"	⅜"
1½"	2"	1"	⅝"	5/16"	3/16"
3"	1"	½"	5/16"	5/32"	3/32"
6"	½"	¼"	5/32"	5/64"	1/32"

The popularity of DI-SAWING is growing by leaps and bounds. Get the complete facts on the most highly developed DI-SAW on the market. Simply write for our DI-SAW Bulletin.

Made by Sawing Machinery Specialists

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

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(640) Turret Lathe

Foster No. 5 Universal Ram Type Turret Lathes. 16 pp. International Machine Tool Corporation, Foster Division, Elkhart, Ind. This new bulletin thoroughly describes this recent addition to the Foster line of turret lathes. Each feature is dealt with individually and "close-up" photographs clearly illustrate the various parts. Machine attachments, standard bar, chucking and cross slide tools, and specifications are listed and illustrated.

(641) Vises

Palmgren Angle and Production Vises. 4 pp. Chicago Tool and Engineering Company, 8383 S. Chicago Ave., Chicago. This illustrated folder explains uses for the various vises — angle, drill press, heavy duty angle, and heavy duty production. Specifications and price lists for each type are included.

(642) Gages and Small Tools

Gages and Small Tools. 104 pp. The Pipe Machinery Company, Cleveland. This new handbook contains a great deal of hitherto unpublished information and data that should be of considerable use to production men. Divided into three sections — gages, tools, and tables — it is indexed so that the reader can obtain quickly desired information from complete specifications, photographs, drawings, and a November price list of gages.

(643) Coolant Pumps

Coolant Pumps. 8 pp. Atlas Press Company, Kalamazoo, Mich. This pamphlet describes the construction of new Atlas coolant systems and their application to lathes, drilling machines, drill presses and milling machines. Pictures of the equipment and prices accompany each item.

(644) Bronze Alloys

Alloys for Uncle Sam. 8 pp. Ampco Metal, Incorporated, Milwaukee, Wis.

(Continued on page 188)

No. 4 in a series showing why "TOMAHAWK" tools do a better job of both machining and helping the war effort.

All set to keep going-

Even the best of Tomahawks require sharpening once in a while. When you've got a job requiring a rotary form tool and you want to keep that job going with the minimum of down time, it is not a bad idea to use, when possible, multiple-gashed carbide tipped forming tools like the **"TOMAHAWK"** tool above.

When one carbide cutting edge is dulled, a sharp cutting edge is restored by simply rotating the tool slightly. This type of construction is particularly effective in tools which are relieved (backed-off) to provide cutting clearance.*

With multiple tipped single point carbide tools like this you can frequently eliminate as much as 90 per cent of your machine down-time for tool changes; you can cut the number of tools you have to carry in stock to keep the job running; you can save grinding time; and you can increase production per machine-hour.

*Genesee Tool Company is one of the few tool manufacturers in the United States with a completely equipped back-off grinding department.

Write for "streamlined" condensed catalog of Genesee tools. Ask for catalog No. GT-42TE.

GENESEE TOOL COMPANY

FENTON, MICHIGAN

* Registered Trade Mark

This booklet gives information on variations of standard grades of Ampco Metal to conform to government specifications. The high-lights of three bronzes — Ampco Grades 15, 17 and 19 — produced for war production are mentioned. Chemical composition, physical properties and other pertinent data are listed in detail.

(645) Turret Lathe

Denver Ram Type 6R Universal Turret Lathe. 10 pp. Stearns-Rogers Manufacturing Company, Denver, Col. This new folder illustrates the 6R lathe, chucking machine, bar machine and power screw bar feed and the corresponding standard equipment. Outstanding features are given special discussion. Specifications for the 6R are also listed.

(646) High Speed Steel Milling Cutters

Milling with High Speed Steel. 23 pp. The Cincinnati Milling Machine Company, Cincinnati. This booklet presents a discussion of High Speed Steel milling cutters, combining the results of research work with practical suggestions in correct shop procedure. Cutter design, mounting of cutters and of work, speeds and feeds for cutters, action of cutting fluids, and care of cutters are explained and also clearly illustrated by drawings and photographs.

(647) Turret Lathe Accessories

Enco Lathe Turrets. 6 pp. E. & N. Manufacturing Company, 3321-23 Monrose Ave., Chicago. This folder briefly describes two new adjustable turret tool posts and two models of a new tailstock turret for bench and small engine lathes and small screw machines. Pictures and prices accompany the descriptions.

(648) Chucks

"Airgrip" Pneumatic and Hydraulic Holding Devices. 28 pp. Anker-Holth Manufacturing Company, McCormick Bldg., Chicago. This new catalog shows this company's complete line of air operated chucks, collet chucks, stationary cylinders and revolving air cylinders. There is a general description of each piece of equipment plus photographs, drawings, specifications and dimensions.

(649) NE Steels

NE, National Emergency Steels. 32 pp. Joseph T. Ryerson & Son, Incorporated, Box 8000-A, Chicago. This new, simplified data book which deals with the selection and heat treating of NE steels should be of interest to alloy steel users. There are tables for converting Jominy Test results into tensile strength, yield point, elongation, reduction of area, etc. Average physical properties after heat treating together with forging, normalizing, annealing and quenching temperature for 30 of the most widely used NE steels are also given.

EVERY MAN
COUNTS FOR MORE
USING SKILSAW TOOLS!
On any surface...on any war job
SKILSAW
SANDERS and GRINDERS
GIVE YOU
Finer Finishing Faster!
SKILSAW PORTABLE GRINDERS
Grind down raised welds faster. Light, compact, powerful. Perfectly balanced for easiest day-long operation. 2 MODELS.
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Speed up all metal cleaning, sanding, sling, grinding with wire brushes (illustrated) cup wheels, polishing pads, etc. 6 MODELS.
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Produce a smoother, better "final finish" 10 times faster than by hand . . . on wood, metals, plastics, compositions. 4 MODELS.
● Have you welds to grind . . . metals to clean . . . "final-finishing" to apply on wood or brass or steel? You can do each job better and faster with one of these SKILSAW TOOLS! They're specially designed for easier handling. They're skilfully engineered for greater output per man at war-time production speeds. They're ruggedly built to stand the gaff of toughest 3-shift operation without time-wasting breakdowns.
Do you wonder why these SKILSAW SANDERS and GRINDERS are favorites everywhere for coarsest grinding or finest buffing. Ask your distributor for a demonstration and see for yourself!
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SKILSAW PORTABLE ELECTRIC TOOLS
★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(650) Centering Instrument

Center Scope Booklet. 16 pp. Center Scope Instrument Company, 351 S. La Brea Ave., Los Angeles. This booklet deals with the methods of optical locating and centering with the Center Scope. A "how to do" booklet, it contains many application pictures showing the job to be done and how it is done with this instrument. The story of optics and the use of optics in the Center Scope are told in detail.

(651) Gages

Rigid Inspection for Greater Perfection. 4 pp. Perfex Gage and Tool Company, Detroit. Explaining how Perfex gages are inspected in a temperature controlled room and with a complete line of the newest checking instruments.

THE END.

THE HANDS BEHIND THE HANDS BEHIND THE GUN!

In the jungles of the South Pacific—on the hot, blistering sands of the North African desert—wherever our boys are fighting for the right to be free—there, bullets MUST fly straight and true to their marks. Only an accurately formed bullet will follow a true and straight course; an unsymmetrical missile may cost a life!

Manufacturers of every type and size of bullet are using every means at their disposal to assure perfect contours on their products.

VINCO takes particular pride in the knowledge that an ever-increasing number of these manufacturers are depending upon VINCO to provide accurate profile gages for the final inspection of their bullets. VINCO also furnishes master gages for checking these profile gages, so that wear will be detected in time.

VINCO Engineers and Mechanics are ready, willing and well equipped to fulfill your most exacting gage requirements.

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Precision tools & gages

VINCO CORPORATION
8857 SCHAEFER HIGHWAY
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A WISE WAR TIME PURCHASE

A LONG-TERM PEACE TIME INVESTMENT

Remember — these same O K Metal Cutting Tools you now find such a help in speeding up war work will be just as valuable in your post-war set-up. By then, your investment will just be getting under way! Their great flexibility of use will put them to work on any product you care to manufacture. Yes, O K Tools are best in war, best in peace, best wherever performance counts!

"O K" FOR EVERY METAL CUTTING JOB

THE O K TOOL CO., SHELTON, CONN.

THE OK SYSTEM

OF INSERTED-BLADE METAL CUTTING TOOLS

Rawhide HAMMERS MALLETS

Carefully made, accurately balanced, with weighted heads where extra striking power is needed. Strike forceful blows without marring or battering, without recoil or bounce. Never split, chip, "smear" or crack, retain this true striking face so every blow goes right to the target . . . gets work done. Long wearing, mechanically cured, coiled Rawhide faces far outlast soft metals, plastics, wood or rubber.

Replaceable Heads

Replaceable Insert Faces are available for C.R. Hammers . . . make each a "lifetime" tool.

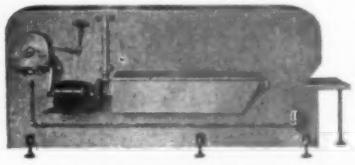
CHICAGO Rawhide MFG. CO.

1397 ELSTON AVE. ★ CHICAGO, ILLINOIS.

LOW COST — EFFICIENT Metal Parts CLEANING

STURDY-BILT *"SIMPLEX"* Metal Parts CLEANER

This small, compact, automatic and mechanically simple unit combines the two most positive methods of cleaning Metal Parts, Assemblies, Shells, Cartridges, Castings, Stampings, etc. A swishing action positively removes all grease, oil, dirt and metal chips that have been loosened during the "chemical action" of the "soak". Can be installed in different departments or in a series — one unit for cleaning, another for rinsing or rust prevention coating and others for special requirements. Send for "Simplex" bulletin for complete details.



and for CONTINUOUS *Large Scale* PRODUCTION

. . . the STURDY-BILT *"Soaker-Hydro"* CLEANER

Combines long agitated "soak" with hydro washing action for large production. Parts are loaded onto trays, passed through the soaking tank — then are rinsed to remove oil film and clinging chips — then subjected to a power wash. They are removed dry and ready for use or for the next manufacturing operation. Simplicity is the keynote of construction as well as operation. Send for complete details.

STURDY-BILT EQUIPMENT CORP.

Department T-2 WEST ALLIS, WISCONSIN

Production Doubled

..ON SHRINK FIT ASSEMBLY OF AIRPLANE LANDING STRUTS!

COMPANY NAMES STARTING WITH C*

increased production

Case Study from the Files of Deepfreeze

The Sub-Zero Method
of Shrinking, Testing and Treating of Metals

*Name on request to bona-fide inquiries

Data and Part Information

Shrink-fit assembly of aircraft landing struts.

Diameter of bore—4.843" ± .002".

Diameter of mating part—4.843".

Deepfreeze metal chilling assures permanent assembly —reduces cost

These airplane landing struts, requiring a permanent shrink-fit, were formerly assembled in 20 minutes including heating time. This was done by heating the female part only.

With the installation of a Deepfreeze Cascade Industrial Unit, in conjunction with heating, the time has been reduced to 10 minutes—rejects minimized.

HOW IT'S DONE

The female part is heated in an oil bath at 450° F. and expanded .005". The male part is shrunk .003" in a Deepfreeze Cascade —120° F. Chilling Unit. The time in oil bath is 5 minutes—time in Deepfreeze 5 minutes. The cooling time to room temperature, in a jig, is 5 minutes—total 10 minutes. They are then inspected and wheel spindle must indicate within .003".

HOW DEEPFREEZE CAN HELP YOU...Deepfreeze sub-zero temperatures (as low as —120° F.) can help you in any one or all three of the following metal working operations:

1—Shrinking of metals for ease of bearing assembly, etc.

2—Testing of metals for reaction of sub-zero temperatures to aircraft instruments, etc.

3—Treating of metals for preventing growth or warp in gauges, etc.

FREE Additional Data *and proof of the outstanding success of the Deepfreeze method for chilling metals are included in this booklet. Write for your copy today.*

REQUIREMENTS

To obtain a *permanent* shrink-fit assembly of airplane landing struts.

DIFFICULTIES

Former method by heat only, unsatisfactory—could not hold even temperature. Too many rejects requiring pulling apart or disassembly.

Other Difficulties . . .

Dry ice was too costly, took too much time to crack and prepare. . . would not handle present production requirements.

SOLUTION

The Deepfreeze Cascade —120° F. Unit used in combination with an oil bath for mating part, meets every requirement, doubles production.

SAVINGS

In addition to savings in time, new method saves approximately $30.00 per day—cost of dry ice.

Deepfreeze

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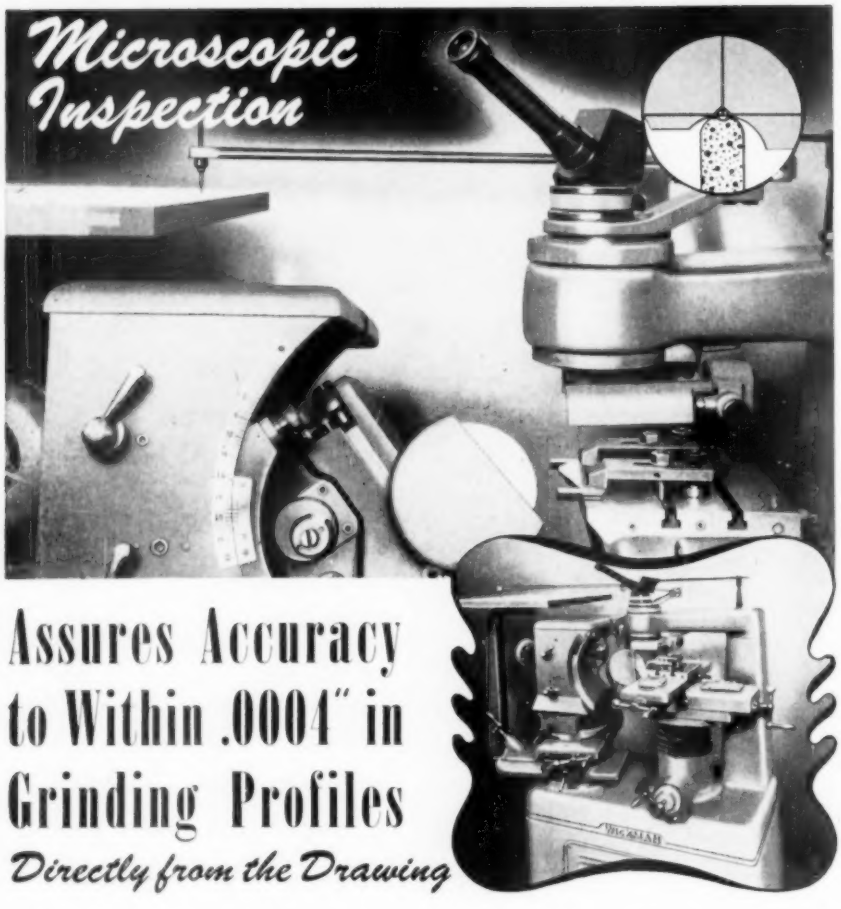
MOTOR PRODUCTS CORPORATION
2311 DAVIS ST., NORTH CHICAGO, ILLINOIS



Assures Accuracy to Within .0004" in Grinding Profiles

Directly from the Drawing

Illustrated above are the essential features of the Wickman Optical Form Grinder. At the upper left is a layout 50 times the size of the profile to be ground. The pantograph pointer is moved along the line of this layout.

The microscope is focused directly on the work and the grinding wheel. The microscope has cross hairs centered in a locating circle as shown in the drawing above. The intersection of these cross hairs corresponds to the position of the pointer on the long pantograph arm.

The grinding wheel is fed by hand to this point after each movement of the pantograph arm, and its exact position is observed through the microscope. As the long arm of the pantograph is moved from point to point on the layout, the intersection of the cross hairs moves correspondingly at the 50:1 reduction.

Straight and circular form tools (particularly carbide form tools) profile gages, templates, punches and dies and many other irregular parts can be finish ground on this machine to the highest degree of accuracy. Literature describing fully the Wickman Optical Form Grinder will be sent you immediately upon request.

WICKMAN OPTICAL FORM GRINDER

THE Wickman CORPORATION

15535 WOODROW WILSON
DETROIT, MICHIGAN

THE CRIB

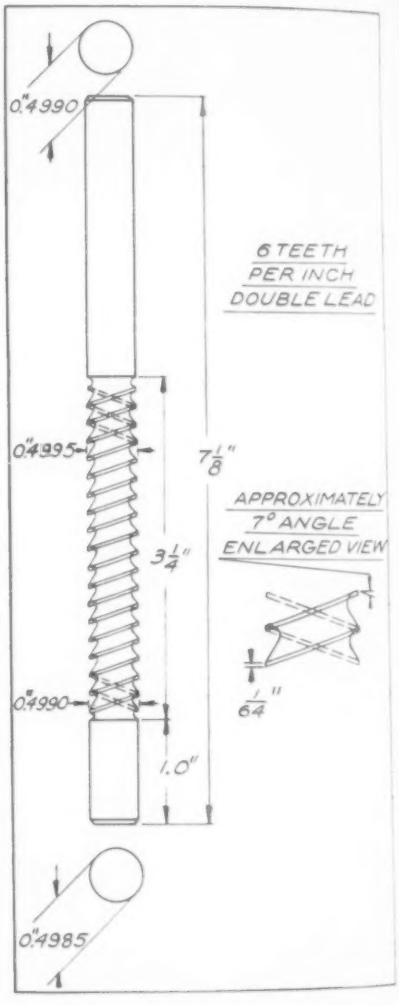
IDEAS · KINKS
SHORT CUTS

T.M. REG. U.S. PAT. OFF.

BROACH TO FINISH ROUND AND STRAIGHT HOLES IN GEAR BLANKS

A broach has been designed to finish holes within .0002-inch of being perfectly round and straight. It is being used to finish-broach the bore in gear blanks and similar parts where the initial machining operation must be held to this tolerance to prevent magnification of error in subsequent machining.

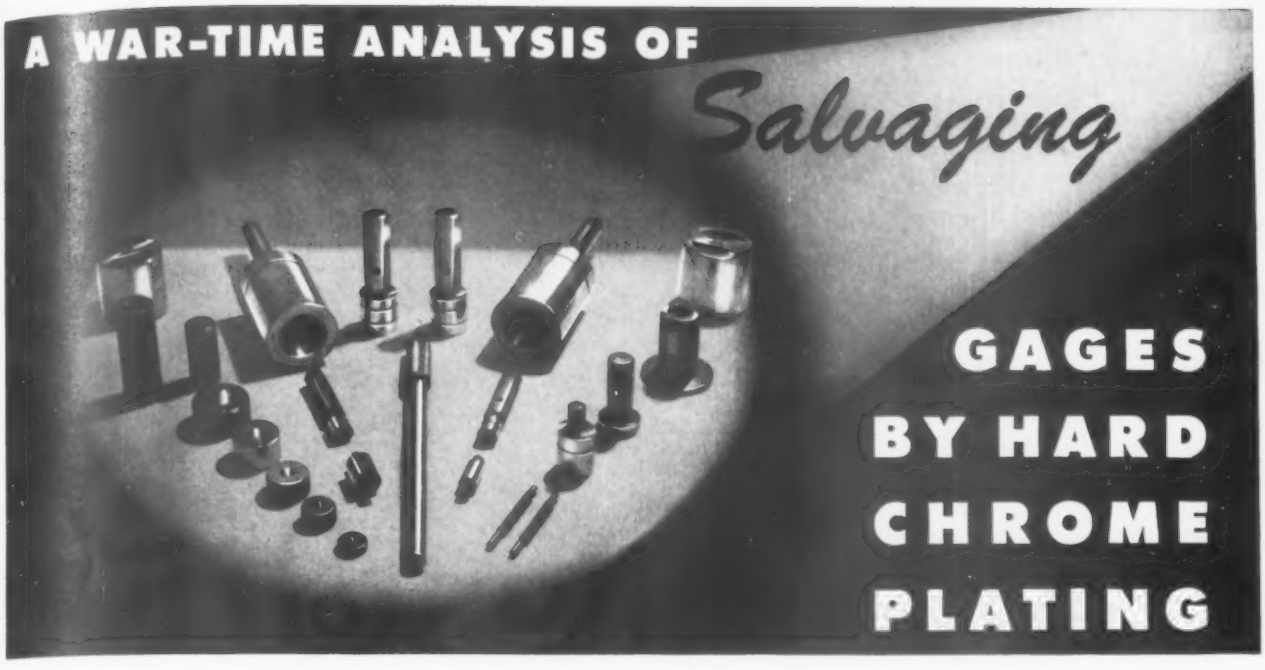
The new tool overcomes difficulties



previously encountered due to broach contortions and such variables as contour of parts and material specifications.

The design of the new broach is simple. It is inexpensive to make, and because it is much shorter than the con-

(Continued on page 194)



Why can the chrome plate salvaging of your worn gages and non-cutting precision tools further the War Effort?

LONGER LIFE: The average wear-resistance of a Lincoln Park chrome plated gage is approximately five times that of a similar gage.

SAVES STEEL—With this salvaging service available, it is not necessary to discard your worn gages and non-cutting precision tools and order new ones which require the use of critical metals. Salvaging not only conserves the steel required for original manufacture but greatly prolongs the life of that over which the plating is applied.

SAVES MAN AND MACHINE HOURS—When one gage is salvaged by chrome-plating, the manufacturing capacity required for the production of five ordinary gages is released for other vital work.

INCREASES MANUFACTURING TOLERANCES—With any gages, wear allowance must always be taken into consideration. However, when wear-resistant gages are used, it is obvious that the allowance for wear can be reduced considerably . . . automatically increasing the manufacturing tolerance. This slight extra percentage of tolerance becomes highly important when the dimensions of parts being inspected are very close to the required limits. It eliminates rejection of parts which should be accepted . . . and, in many cases, effects great savings both in expensive parts and man-hours.

Chrome plate salvaging is and has been for several years past—an important and highly specialized part of Lincoln Park's operations.

LINCOLN PARK TOOL and GAGE CO.
LINCOLN PARK, MICHIGAN

(Continued from page 192)

ventional broach and is used on a hand arbor press, it is more economical to operate. Resharpening is easy, and is necessary only after from 4000 to 5000 parts have been finished.

It is designed to finish the bore with a burnishing effect to within .0002-inch tolerance after it has been rough-broached .0005-inch under size.

The new broach is made of high-speed steel with a pilot one-inch long, the diameter of the rough-broached hole, a double Buttress thread approximately three inches long, and a shank long enough to push the Buttress through the work. The diameter of the shank is the same as the diameter of the finished hole. The reaming portion has a taper of .0004 in 2¼ inches, and the last half-inch is left the size of the finished hole. A good burnishing effect is obtained if the last quarter-inch is not backed off as much as the cutting part of the broach.

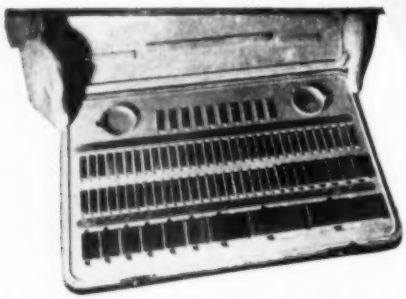
This design can be modified readily in accordance with the hole being broached and the material of the part. The smaller the diameter of the hole, the finer the thread that will be required. For example, eight threads per inch should be used for a one-quarter inch diameter hole. A single thread with hardly any undercut should be used for brass, while a triple thread with as much undercut as possible should be used for aluminum.

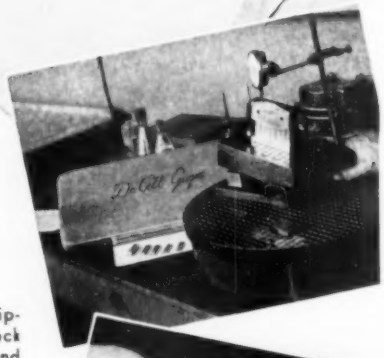
According to Howard Fancher, methods man at General Electric's Schenectady Works, the broach should be machined as follows:

Rough-turn and chase Buttress thread, harden and rough-grind, grind undercut on Buttress lead, and finish grind to size.

DoAll GAGES

• The Measure Blocks of a Thousand Uses





Every manufacturer of armaments, metal parts, equipment or tools needs DoAll Gage Blocks, to check dimensions for absolute accuracy at the source and along every step during production.

DON'T TAKE CHANCES ON ANY PRECISION TOOLING

Be sure of your gages! World War No. 2 is being fought with measurements ten times as accurate as before.

DoAll Gage Blocks are a "must" for your laboratory, having tool room and inspection department. Why risk a whole shipment or even a partial shipment of badly needed parts rejected because they do not interchange in a certain instrument or work smoothly enough?

America has no time to wait for re-runs. Every hour counts. Parts must be right the first time, and very right. Peacetime production will insist on today's tempo of tolerances too.

DoAll Gage Blocks come in the following accuracies:

Working Set—Eight millionths of an inch	295.00
Inspection Set—Four millionths of an inch	350.00
Laboratory Set—Two millionths of an inch	
A room with temperature controlled at 68° is recommended for using this set.	
	Price on application

Each Set consists of 81 Gages

Write us immediately for complete data and good deliveries

SAVAGE TOOL COMPANY

Dept. TE **Savage, Minn.**

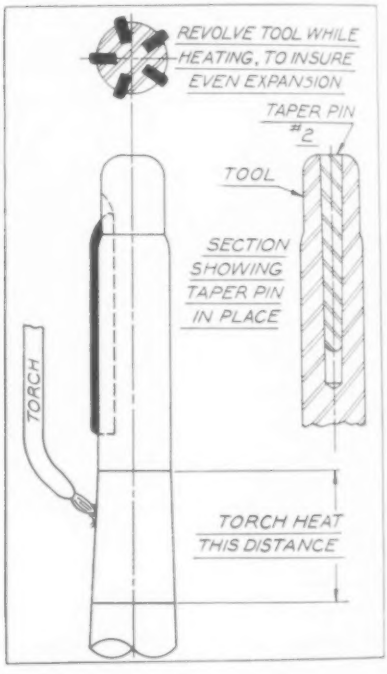
Local DoAll offices distribute Gage Blocks. They also sell and service DoAll Precision Surface Grinders, Contour Machines, Band Saws and Files. See your Telephone Directory for nearest DoAll office.

TOOL FOR BURNISHING VALVE TAPPET HOLES

With conservation the main topic in industry, a 310 percent increase in tool life is indeed worth application.

The accompanying sketch shows a tool which is used for burnishing valve tappet holes in cylinder blocks. Originally this tool was scrapped as soon as it became undersize. This meant producing only 4125 pieces per tool. Now, when it becomes undersize, the tool is treated as follows:

Torch heat to approximately 1200° F. Cool in box of lime. The reason for heating is to obtain the expanding action on the braze, securing the carbide to the body. Cooling will not result in contraction.



The tool is then good for approximately 2750 pieces.

A second heat affords approximately 1385 pieces; third heat — 550 pieces. Total production resulting from three heats is approximately 8810 pieces.

After three heats, the end of the tool is drilled and taper reamed for a No. 2 taper pin. Next the tool is heated and the pin driven in place. Tool is then lapped back to size. This is repeated six times giving an additional 8250 pieces, or an approximate total of 17,060 pieces.

By pieces, the above figures have reference to complete blocks with 12 holes per block. At this rate, 204,720 holes are burnished per tool.

The life of the tool is increased approximately 310 percent at exceptionally small cost. THE END

Whatever You Require in

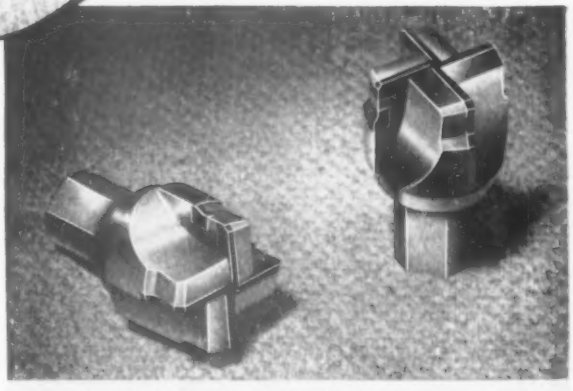
CEMENTED CARBIDE TIPPED CUTTING TOOLS

...Produced By A Company Whose Entire Facilities Are Devoted To Carbide Work

YOU NAME the cemented-carbide tipped cutting tool you need — Carbide Fabricators can supply it.

Standard tools are being produced in ever-increasing quantities. Some are carried in stock, ready for immediate delivery. In addition to the tools illustrated above, complete lines of other standard tools are listed as catalog items. Simplified methods of numbering and pricing eliminate much of the difficulty usually encountered in ordering the tools required for specific jobs.

Thousands of special tools have been manufactured by Carbide Fabricators to meet the specific requirements of many of the country's leading manufacturers. As this company is an authorized supplier of Carboloy, Vascoloy-Ramet and Firthite cemented carbides, individual preferences for wear-resistant materials can always be met when specified. Prompt delivery can be expected on practically all orders.



SPECIAL TOOLS

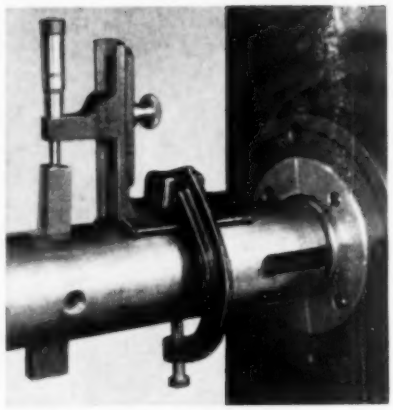
Directly From Your Blueprints

Illustrated is a two-step counterbore and chamfering cutter for four flute center cutting — just one of the many special tools produced by Carbide Fabricators. On inquiries regarding work of this nature, it is *essential* that we have your blueprints to furnish you with full information and prices.

Carbide Fabricators Co. ROYAL OAK MICHIGAN

MFRS. OF STANDARD AND SPECIAL CEMENTED CARBIDE TIPPED TOOLS

BARTELT TOOL SETTING GAGE



★ FOR FASTER BORING TOOL SETTING—*even by Green Hands . . .*

With this gage, you don't have to take trial cuts, mike them, and jog the cutter. Take a rough cut if you like, reset the tool to exact finishing size with this gage, and go ahead. Or, set the tool right to size to begin with, and do the job in one cut.

★ **Designed by a Practical Man**

An old boring hand thought this one up. It saves him a world of time—and it will do the same for the new fellows. Teach a new man how to use this gage, and watch him turn out the work! The gage can be used for a lot of other things, too. **Write for our new circular . . . .**

BARTELT ENGINEERING CO.

1214 Partridge Ave., Beloit, Wis.

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Speed Lathes

SPEED UP PRODUCTION

USED FOR FINAL FINISHING OPERATIONS

ECONOMICAL POLISHING LAPPING, BURRING, BURNISHING, FINISHING

OF

GEARS
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Built to meet the requirements of those desiring a heavily constructed, smooth running machine of highest quality.

Has motor in base with variable speed control, using REEVES standard pulley and belt.

Smooth automatic brake acts instantly when switch is thrown. Collets or chuck may be used

GOOD DELIVERY

MACHINERY BUILDERS SINCE 1879

WRITE FOR DETAILS

COLBORNE MFG. CO.

157 W. Division St., Chicago, Ill.

COLBORNE—THE SPEED LATHE PEOPLE

Columbia TOOL STEEL

SPEED—

Speed production by making "Good" use of "Good" Tool Steel, but do not buy more than you need.

Speed Victory by buying War Bonds.

It pays to use Good Tool Steel.

COLUMBIA TOOL STEEL COMPANY

ARTHUR T. CLARAGE, PRESIDENT
GENERAL OFFICE AND WORKS
500 EAST 14TH STREET • CHICAGO HEIGHTS, ILL.

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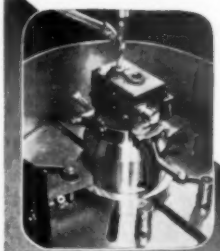
Zagar Indexing and Holding Fixtures are extremely simple in design (one handle, for example), very rugged, fool-proof, virtually indestructible. They make possible short cuts which jump production and profits. Get the latest, well illustrated full story. Ask for our **BULLETIN E-1**



Using 2" Zagar Index Fixture with special drill jig for drilling and loading simultaneously has doubled production. Let us engineer and tool your production problems.

THE Zagar COLLET CHUCKING FIXTURE
A Universal DEVICE FOR INDEXING OR HOLDING WORK ON MACHINE TOOLS
Manufactured by ZAGAR TOOL, INC. CLEVELAND, OHIO

ZAGAR TOOL, INC.

23880 Lakeland Blvd. Cleveland, Ohio

AMERICAN SOCIETY OF TOOL ENGINEERS, Inc.

2567 W. GRAND BOULEVARD, DETROIT, MICHIGAN

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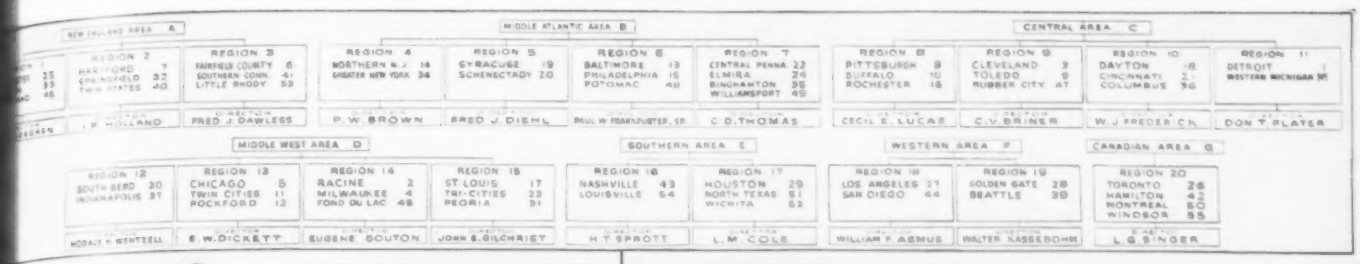

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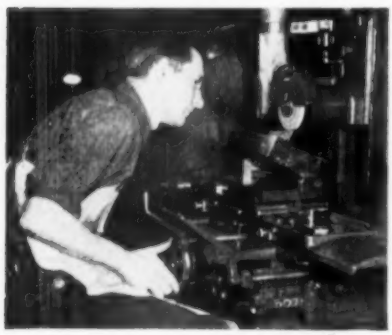
A. S. T. E. DOINGS . . . . . .

BINGHAMTON. Approximately 130 members and guests attended the January 6th meeting of the Binghamton Chapter at the Arlington Hotel. They heard Mr. H. E. Linsley of Wright Aeronautical Corporation, who presented a sound picture entitled "Power by Wright" and a silent picture showing tooling used in the fabrication and assembly of Wright motors.

During the business session, the War Effort Telegram from the National Secretary was read, and also the resignation of Chapter Chairman Kishbaugh. Two members were elected as the nominating committee for 1943. They were Herman Keller of Scintilla Magneto and S. K. Bishop of Agfa Ansco.



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BOSTON. Precision die-making and precision die-making machines were the subjects of talks delivered by Richard F. Moore, president of the Moore Special Tool Company, Inc., of Bridgeport, Conn., and J. Robert Moore, production manager of the Jig Borer Division, at the January 14th meeting of the Boston Chapter, which was held at Schrafft's Restaurant. The Moore executives are brothers.

The December 10th meeting of the Boston Chapter drew 108 members and friends for the dinner and 150 for the technical session. The speaker of the evening was Mr. S. D. Fendley, application engineer, Industrial Engineering Department, General Electric Company at Schenectady. His subject was "Electronic Motor Controls" and was demonstrated with one of these machines.

Mr. Ray Morris, first vice president of the Society, also spoke at this meeting on the doings of the A. S. T. E. in connection with cooperation with the War Production Board. Bill Young was called upon to give a short talk on the Talent Survey.

James L. Handley, tool engineer and designer of the F. H. Robertson Company and Walter Pohle, superintendent, Spray Engineering Company, gave two gadget talks. Henry Richards attended this meeting and showed a colored film on the Manufacture of Grinding Wheels by the Norton Company of Worcester, Mass.

BRIDGEPORT (FAIRFIELD COUNTY, Mr. Fred Dawless, manager of the Crucible Steel Company of America, was the coffee speaker at the December 9th meeting of the Fairfield County Chapter which was held at the Stratfield Hotel, Bridgeport.

At the technical session a film was shown on "Actions of Metal Cutting Tools as Seen Through the High Speed Camera," by the General Electric Company. The guest commentator for this film was Mr. J. C. Molinar, tool engineer and New York District Sales Manager for Pratt & Whitney Company. Mr. Molinar discussed the highlights of the film which illustrated milling, broaching, planing and punch press operations.

BUFFALO. 150 couples attended the Ladies Night and Christmas Party of the Buffalo-Niagara Frontier Chapter, which was held on December 17th in the Hotel Lafayette Ballroom. In addition to a holiday buffet dinner and an entertaining guest speaker, Thomas J. McDonnell, there were jewelry compacts for all the ladies, turkeys awarded to lucky members, five acts of theatre vaudeville, and continuous music by an orchestra.

National president O. W. Winter and Mrs. Winter came from Chicago to attend this party. Wm. J. Gamble was chairman of this party and his aides

(Continued on page 200)

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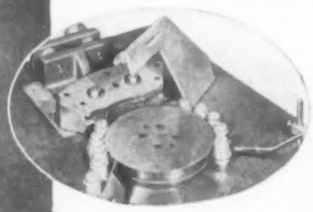

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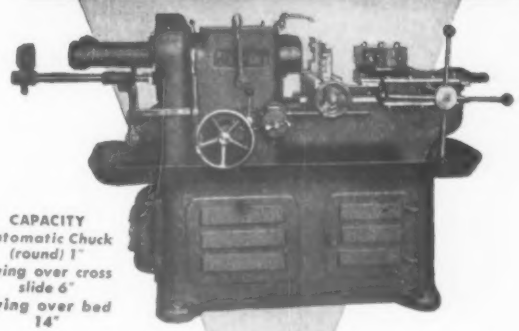

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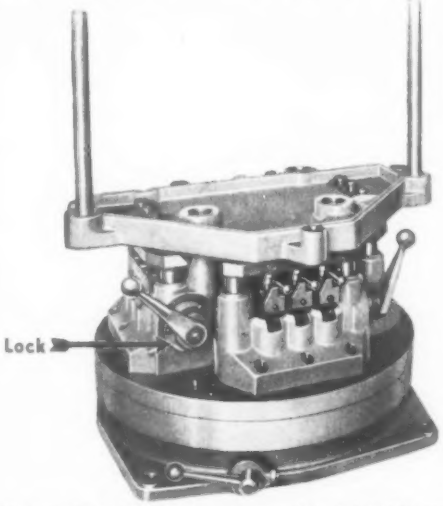

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CHICAGO. More than 250 enthusiastic members and guests attended the December 7th meeting of the Chicago Chapter at Huyler's Restaurant. Chairman Hoefer announced the names of 22 new members.

Speaker of the evening was Lt. A. J. Dore of the United States Army Ordnance, Chicago District, who spoke on the conservation of critical materials. Lt. Morrey and Mr. G. E. Parker, also active in the conservation of critical materials in their work in Army Ordnance, described the new Army Ordnance National Program which they called "Tremendous Trifles."

President Winter talking with friends at Buffalo Chapter Christmas party.

National president, O. W. Winter gave a report on the recent A. S. T. E. National Board of Directors meeting in Detroit. Mr. Winter presented the new chairman lapel pin to Chapter Chairman, Roy Hoefer.

The motion picture "Tool Salvage" was shown through the courtesy of G. W. Hecht of International Harvester Company.

CLEVELAND. The after-dinner speaker at the January 8th meeting of the Cleveland Chapter, said to be the largest meeting of the current year, was Mrs. Florence Bines, an ambulance driver who saw duty in the evacuation of the Malayan States.

The speaker at the technical session was Mr. J .D. Trethaway of the Cerro de Pasco Corp., who spoke on the "Industrial Application of Bismuth Alloys."

At the short business session, R. E. Harrold and F. W. Denning were elected to serve as nominating committee for the coming February election. The Chapter approved a motion to buy $500.00 in War Bonds from its treasury.

DAYTON. This Chapter held a Christmas party and dinner dance at the Shrine Club in Dayton on December 10th. 43 couples were in attendance and Jack Blair acted as Master of Ceremonies for the event.

ELMIRA. The January 4th meeting of this Chapter was held at the Mark Twain Hotel. Ellis P. Oldham, 2nd vice chairman, absent for the past eight months, introduced the speaker of the evening, Mr. Walter R. Breeler, Assistant General Manager of the Allegheny Ludlum Steel Corp. of Dunkirk, N. Y. Mr. Breeler's talk, augmented with slides, was on the subject of "Moly High Speed Steel." A motion picture was shown which dealt with the cutting of metal and was entitled "Microtiming."

Ray H. Morris, the National Organization's first vice-president was also present at this meeting and gave a talk on the value of the Society and what it meant to its members. At the business session, Howard E. Stratton and Glenn E. Bauder were elected as the nominating committee for the coming election.

FOND DU LAC. W. J. Meinhardt of the Meinhardt Diamond Tool Company, Chicago, spoke on "Industrial Diamonds" at the January 8th meeting of the Fond du Lac Chapter. W. E. Rutz of the Giddings and Lewis Machine Tool Company assisted in the presentation of a film on "Induction Hardening" produced by the Van Norman Machine Tool Company.

E. J. Kaiser and C. Pratt were named as a nominating committee for the February election.

(Continued on page 202)

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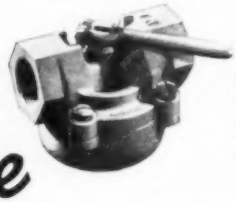

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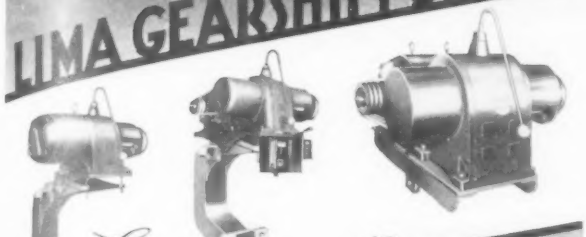

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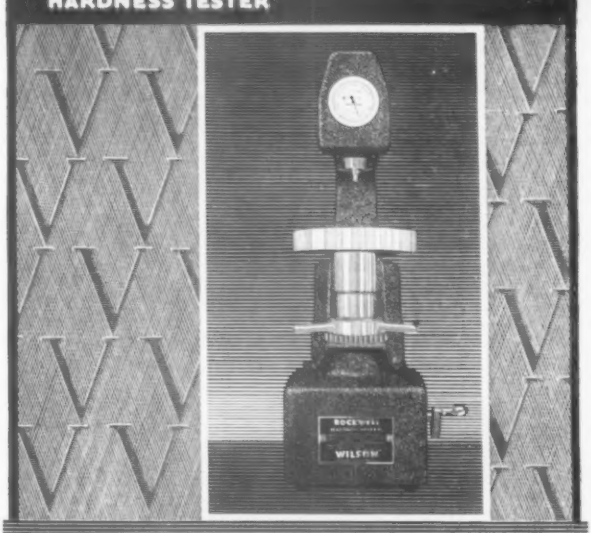

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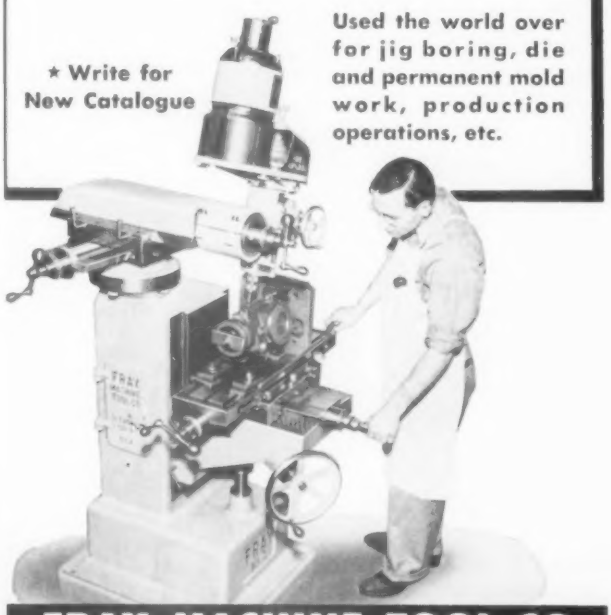

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Makers of "All-Angle" Milling Machines & Milling Attachments

HAMILTON. 150 members and guests attended the January 8th meeting of the Hamilton Chapter, which was held at the Royal Connaught Hotel. Speaker of the evening was Mr. R. H. Bruce of the Gisholt Machine Co., Madison, Wisconsin, who presented a film on "Turret Lathe Operations and Use."

HARTFORD. Mr. G. M. Sieger, president of the S. M. S. Corporation, was speaker at the technical session of the January 4th meeting of the Hartford Chapter. Mr. Sieger talked on "Welding, Its Present and Future Status." About 70 members attended the dinner meeting and those at the technical session numbered about 115.

HOUSTON. Six new members were introduced to the members of the Houston Chapter at their December 22nd meeting. This meeting was Ladies Night with 65 members and 50 wives present.

The speaker for the evening was National President, O. W. Winter. Mr. Winter gave three talks in one—"The Importance of the Tool Engineer in the War program, "Women in Industry", and "The Place Russia can be Expected to Fill."

LOS ANGELES. The door prize at the January 14th meeting of the Los Angeles Chapter at Scullys Cafe was a $5.00 War Savings Stamp. The two speakers at this evening meeting were Gus Zellmer and Dick Smith of Cook Heat Treating Co. Both spoke on the subject "Tool and Die Hardening Problems."

Two films were also shown at this meeting. The first was "Induction Hardening Machine Parts." The second was "Heat Treating Hints" presented by The Lindberg Engineering Company of Chicago. Coffee speaker of the evening was Arthur D. Lewis who had as his subject "Portable Resistance Welding Equipment."

MILWAUKEE. Among those present at the January 14th meeting of the Milwaukee Chapter at the Republican House, were Adrian L. Potter, Executive Secretary of the National Organization; Gene Bouton, Regional Director of that Chapter's area; Thor Olsen, vice president, Jeff Miller, sales manager of Thread Grinding Division, and Gilbert Stewart, chief engineer of the Thread Grinding Division of Ex-Cell-O Corporation of Detroit.

Mr. Stewart gave the principal talk on the development of threads and the most recent developments in thread grinding. His talk was illustrated with slides showing some of the latest machines manufactured by this concern.

Julius Riedl and Foster Koehn were elected to the nominating committee for the coming election of officers.

MOLINE (TRI-CITIES) Mr. A. A. Cambria, engineer at the LaPointe Machine Tool Co. of Hudson, Mass., was the main speaker at the January dinner meeting of this Chapter which was held at the Blackhawk Hotel. Mr. Cambria spoke on "Broaching and Modern Broaching Methods," indicating, in particular, the speed that can be made and the close tolerances that can be held in the internal and external broaching of certain parts for the War Program.

Following Mr. Cambria's talk, the Aluminum Company of America presented three sound movies on the machining, riveting and welding of aluminum.

At the business session Mr. W. Z. Fidler and T. W. Brown were chosen as the nominating committee for the coming February election.

NASHVILLE. The regular monthly meeting was held at the Andrew Hotel on Friday, December 6th. Two films were shown at this meeting. The first one was "Heat Treating Hints," the sound and color film presented by the Lindberg Engineering Co. of Chicago. The other film was on "Induction Hardening of Machine Parts," which was presented by Van Norman Machine Tool Company.

NEW HAVEN (SOUTHERN CONNECTICUT CHAPTER. The January 7th meeting of this Chapter was held at the Hotel Garde in New

(Continued on page 204)

Style No. 12

Style No. 6

Cratering of lathe tools is caused by chips adhering to the cutting tip, pulling off minute particles of the cutting composition and leaving a depression or crater at the cutting edge.

Cratering action of tools is particularly rapid when machining soft steels. Through the use of KENNAMETAL, an intermetallic compound, tungsten-titanium carbide, chips do not adhere to the tip but flow continuously. The low thermal conductivity of KENNAMETAL throws the heat back into the chip itself and prevents a local generation of heat, the tool and the workpiece remaining cool even at high speeds.

You can avoid tool consumption from cratering even when machining high Brinell steels by using KENNAMETAL tools in your lathes. For most boring, turning, and facing operations the strong, durable KENNAMETAL Grade KM is the proper selection, but for cutting soft steels below 200 Brinell and for light cuts on very hard steels from 400 to 550 Brinell Grades KH and K3H should be used.

Write for your copy of the new KENNAMETAL Tool Manual which gives complete information about the uses and handling of this superior cutting carbide.

KENNAMETAL THE All American CARBIDE

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THE UTILITY SLEEVE
Removable Taper Shank
TOOL DRIVER

CUTS SMALL TOOL COSTS

SIMPLE,
POWERFUL,
POSITIVE,
ACCURATE.

For:
TAPS
DRILLS
REAMERS
END MILLS
COUNTERSINKS
CENTER DRILLS
COUNTERBORES
WOODRUFF CUTTERS
TAPER PIN REAMERS, ETC.

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FASTEST FEEDING

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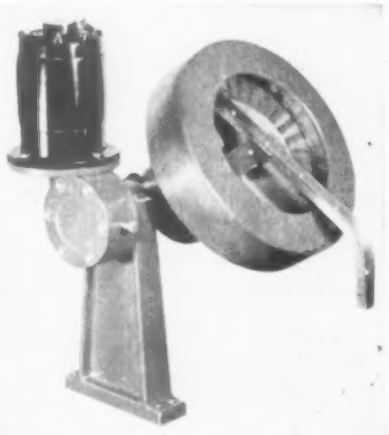
Bullet Cores
Discs, Nuts,
Rivets,
Screws,
Pins, Roller
Bearings,
Special
Parts.

Adaptable
To Presses,
Centerless
Grinders,
and
Special
Machines



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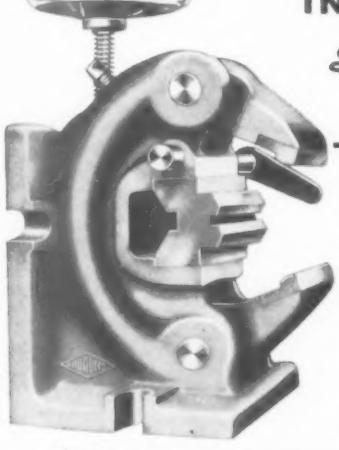
DETROIT POWER SCREWDRIVER CO.
2805 W. Fort St. Detroit, Mich.

A Natural...

IN ANY SHOP

Self Centering Shaft Vise



This modern machine vise is a "natural" because it just naturally is an asset to any machine shop. For machining slots and keyways in shafts or spindles, ⅜" to 3⅛" diameter—suitable for horizontal or vertical mounting. Setting of vise remains unaltered for all work diameters—insures accurate radial cuts. Hardened V jaw reversible in vise—equal movement of two jaws locates shafts correctly in V jaw.

Base size 8" x 7¼". Approx. wt. 80 lbs.

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Gusher Pumps give you a copious, dependable, trouble-free flow of coolant for speedy, efficient production. You get the advantages of many ***patented and exclusive*** features.

The leaders in machine tool production depend on Gusher Pumps. Our lines includes immersed types, tank units, pipe-connected types, flange-mounted types and plain drive types. From a dribble to 200 g.p.m. Learn what the leader in the coolant pump field has to offer you. There's a Gusher to meet your needs.

Write!

Model 5-P3
This new Gusher has a large mounting flange so as to be interchangeable with larger Gusher Pumps. Right or left discharge.
1/10 H.P. Maximum Capacity: 10 g.p.m.

THE RUTHMAN MACHINERY CO.
1815 READING ROAD CINCINNATI, OHIO
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

Haven. The speaker of the evening was Mr. Burns George of Vanadium-Alloys Steel Company at Latrobe, Pa. Mr. George talked on "Making and Shaping of Tool and Die Steels."

At the business session J. J. Bellemore, John Gill and A. Pollard were appointed as a nominating committee for the February election.

NEW YORK. The North Ballroom of the Hotel New Yorker was the scene of the January 4th meeting of this Chapter. Mr. G. H. Sanborn of the Fellows Gear Shaper Company of Springfield, Vermont was the speaker of the evening. Mr. Sanborn talked on "Gears at War."

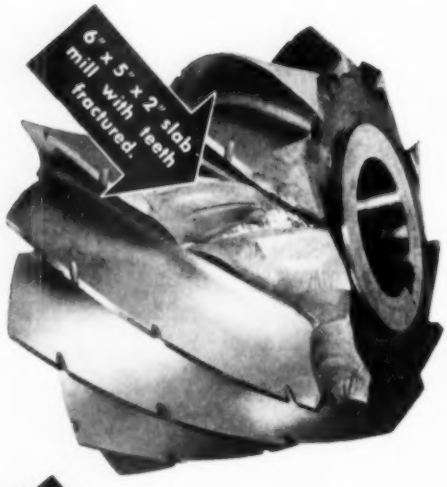
NORTHERN NEW JERSEY. Attendance at the December 8th meeting of this Chapter, which was held at the Robert Treat Hotel, numbered 135. Mr. Glen Stimson, sales manager, Gage Department, Greenfield Tap & Die Company was one of the speakers of the evening. Mr. Stimson covered briefly the various gage methods and a moving picture was shown which illustrated his talk. Mr. Oscar Koehler, chief engineer, gave a talk on the technical side of gaging various threading jobs.

PITTSBURGH. The Fort Pitt Hotel was the scene of the January 8th meeting of the Pittsburgh Chapter. Mr. W. B. Peirce of the Flannery Bolt Company spoke on the subject of "Staybolts to Gun Barrels." Mr. Peirce included slides with his talk to show the various steps in the manufacture of gun barrels produced at his company's plant.

At the short business session which followed the dinner, Mr. E. D. Gangwere and W. B. Peirce were elected as the nominating committee.

The annual Christmas party of this Chapter which was held at the Fort Pitt Hotel on December 18th was attended by over 300 members and guests.

DON'T SCRAP YOUR BROKEN HI-SPEED STEEL TOOLS!



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IS ON THE TOP!

"Suttonizing" has earned and is holding this "top spot" in the welding reclamation of hi-speed steel tools. Tough jobs have not slowed down "Suttonizing"—but rather have boosted its popularity unbelievably in the year that it has been used for salvaging most all types of difficult to repair tools. Wire or write for our catalog describing the "Suttonizing" method.

HERE ARE SOME TYPICAL TOOLS RECLAIMED BY "SUTTONIZING". Fractured teeth can be repaired on the following: shell mills • large size end mills • plain mills • broaches (subject to our approval) • side mills (cracked 4" O.D.—low limit) • boring, slotting, cut off and turning tools repaired or fabricated.

WELDING EQUIPMENT & SUPPLY CO.
222 LEIB STREET • DETROIT, MICHIGAN

PROVIDENCE. The Little Rhody Chapter met at the Shrine Club on December 28th with about 45 members and guests. Bell Aircraft's picture "Cannon on Wings" was shown in technicolor at this meeting.

The speaker of the evening was Mr. Dean R. Morley, Chief of the F. B. I. in the Providence area. Mr. Morley gave some interesting highlights regarding sabotage in the industry. Chan Gardner of the Johnson Automatics Company was the coffee speaker. His subject was on "Necessity of Quality Maintenance."

ROCKFORD. The January meeting of this Chapter varied from other meetings in that the speaker of the evening presented a travelog on Iceland rather than a technical talk.

Mr. Arni Helgason, vice-president of Chicago Transformer Co. and leading authority on Iceland and its people, gave an interesting talk and showed unusual motion pictures in natural color on this island in the Atlantic.

Henry Ruehl of Fairbanks-Morse Co. and Lee White of Ingersoll Milling Machine Company were elected as a nominating Committee for the February election.

ST. LOUIS. Mr. A. L. Stiegel of the Aluminum Company of America was the speaker at the technical session of the January 17th meeting of this Chapter which was held at the Hotel Melbourne. Mr. Stiegel presented a film entitled "Unfinished Rainbows."

Paul Walther and Ed. Doogan were elected by the members to serve as a nominating committee for the coming February election.

SAN FRANCISCO (GOLDEN GATE) The annual Christmas party of this Chapter was held on December 16th at the Oakland City Club Hotel. The party was in the form of a dinner-dance which included a short talk by the present chairman, Mr. Walter Kassebohm, and also a talk by past chairman Mr. Karl Bues.

Arrangements for this party were under the supervision of Mr. Kelton Steele, assisted by Mr. Les Martin.

SPRINGFIELD, VERMONT (TWIN STATES) The January meeting of the Twin States Chapter was Executives Night. The speaker of the

(Continued on page 206)

BOYAR-SCHULTZ SMB MACHINE BOLTS

IT is cheaper to use good bolts than to repair the beds of costly machine tools.

S M B Bolts were developed for use in the tool room as well as in the modern busy machine shop. They are tough and strong, and will stand up under heavy working conditions. Made of special heat treated steel, they are machined with heads square with bodies. Thus, heads present a flat surface to T-slot, safeguarding accuracy of machine and holding work in exact position for heavy cuts.

S M B Nuts and Washers are ***made*** for use with S M B Bolts. They are heat treated and carefully made with threads cut square with face of the nut.

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ACCURATE SPACING ASSURED

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RED-E MILLING MACHINE DOG

The easiest way to avoid "THAT ONE THICK TOOTH" in gear cutting.

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Transferred easily from machine to machine or machine to bench—especially useful for pieces difficult to hold in chuck jaws. Catalog of full line on request. **No Wires—No Heating—No Operating Costs.** Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

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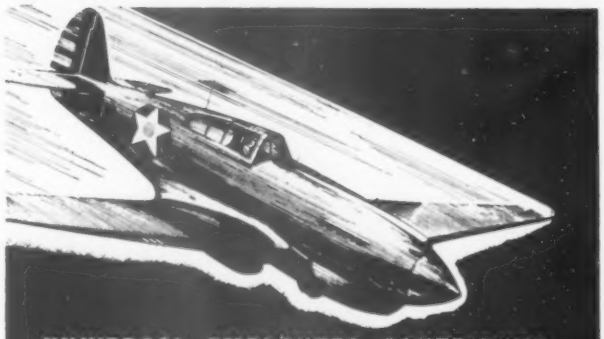

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We are proud to announce that out of their own pockets, the employees of Universal have bought and paid for a $50,000.00 fighter plane for Uncle Sam. And this, mind you, they have done in addition to subscribing 20% of their pay for War Bonds.

We are proud too, of our precision-built Universal Drill Bushings that are straight and round and have superfinished bores for accuracy and long life. Write today for complete facts.

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evening was Frank W. Curtis immediate past National President of the Society. Mr. Curtis showed an action color film which illustrated his talk on "Hardened Gears Without Grinding." Among others present at this meeting were Ray H. Morris, first vice president; Irwin Holland, Regional Director; and K. F. Thomas, vice chairman of publicity for New England.

The J & L double quartet sang several selections during this meeting which was held at the Masonic Temple. Chairman Bob Gillette was Toastmaster at this meeting and sound movies on manufacture of tanks closed the meeting.

SYRACUSE. At the December 9th meeting of the Syracuse Chapter, which was held at the Hotel Syracuse, a business session was held in which several changes in the executive line-up of this Chapter were made. Mr. Stephen Urban was advanced to chairman from vice chairman through the resignation of Clayton Ainsley. Mr. Moffet became vice chairman and Mr. E. S. Masiotte was elected second vice chairman and Mr. H. D. Mozeen was elected treasurer.

The speaker of the evening was Mr. R. A. Cole, experimental engineer, of the Norton Company at Worcester, Mass. Mr. Cole gave a talk on measuring surface finish, which was illustrated with lantern slides.

WASHINGTON (POTOMAC) The reports from this Chapter on its January 7th meeting, which was held at the Harrington Hotel, are very enthusiastic. 96 members attended the dinner ond over 200 were present for the business meeting and technical session.

The speaker for this meeting was Mr. Harry Crump, formerly with General Electric Company and now engineer with the Carboloy Company of Detroit. Mr. Crump talked on Cemented Carbides and showed slides and a motion picture entitled "Grinding Carboloy."

Also shown at this meeting was a movie entitled "The Fourth Kingdom," a story of plastics in color and sound which was shown through the courtesy of The Bakelite Corporation.

Over 200 couples attended the first annual dance of this Chapter, which was held at the Wardman Park Hotel Burgundy Room on the night of January 13th.

WINDSOR. Mr. Reid of the Ford Motor Company gave a coffee talk at the January 11th meeting of the Windsor Chapter in the Prince Edward Hotel. He spoke on the "Heat Treatment of High Speed Steel."

The 133 in attendance at this meeting heard the guest speaker, who was Mr. Phil Murch of the Jones & Lamson Company of Springfield, Vermont. His subject was "Inspection by Projection."

At the business session, Mr. M. Smith and Mr. J. Blowey were elected to the Chapter officer nominating committee.

WORCESTER. The main speaker at the January 5th meeting of the Worcester Chapter was Mr. T. H. MacHafferty, district manager of Carboloy Company, who spoke on the application of carbide tipped tools and cutters.

Chairman Goff presided during the business session, Henry Merrill and Charles Banks were elected as nominating committee.

CHIPS FROM A. S. T. E. NATIONAL HEADQUARTERS

Across Shirley Schafer's desk goes each piece of mail and each package coming in to National Headquarters. How she keeps her smile these days is a problem to the "Chipper." With mails as they are, slow and irregular, her job is a complicated one. During nearly a month of the holiday (?) period, we had only one mail delivery each day and that one near noontime. To route this mail, to check all the membership applications (more than ten a day), to see that the proper person saw, as soon as possible, the mail with questions best answered by each of them was no small task. She still wears her smile, though, so remember Shirley Schafer when you write, and know that you will get the best possible attention.

Once more the "Chipper" is aston-

(Continued on page 208)

NEW LOW-COST 14" BAND SAW FOR PRECISION CONTOUR SAWING

It Is Also An All-Purpose Cut-Off Machine For

IRON & STEEL
BRASS & COPPER
ALUMINUM & ZINC
WOOD & PLYWOOD
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BRAKE LINING
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Or Other Tough Industrial Materials

SPECIFICATIONS

Throat depth—13½". Under Guide Clearance—8⅝". Blades, width—⅛" to ¾" wide; length—98". 8-Speed Gear Box Drive—92, 128, 183, 250, 1650, 2420, 3260, 4100 ft. per minute. Micrometer Set Blade Guides with New Type Jaws. Height—67"; Floor Space—27½" x 29"; Weight—365 lbs. Model shown $214.50, F.O.B. Factory, with ½ h.p., 1 ph. motor. Blade Welder for inside cutting, $90.

For Toolroom or Production

The new Boice-Crane is built for use anywhere in the plant—right in production lines or in foundries for gruelling continuous use, also for exacting tool room use.

Big savings on all straight, angular and contour cuts. For removing metal roughing out die blanks, cams, punches, etc., the savings over ordinary methods like milling and shaping are positively astounding.

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Send me 1943 Catalog.

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POWER TOOLS FOR METAL AND WOOD-WORKING TRADES

AN IDEAL INDEXING FIXTURE

for • Drilling • Grinding • Slotting
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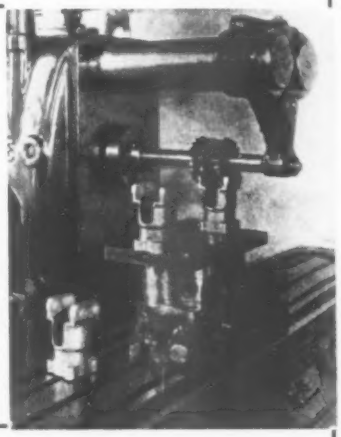
This illustration shows the Hartford Super-Spacer being used in the milling of three surfaces in tough alloy castings. Operator loads one piece while the other is being machined. Vertical feed is used. Possibilities for similar applications are endless.



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Applicable to DRILLING, MILLING, GRINDING, PLANING, JIG BORING, and SLOTTING. Write today for complete information concerning this unusual indexing fixture.

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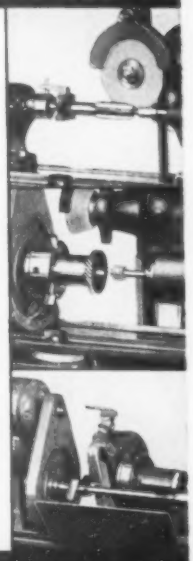
Designed specially for *The Modern Tool Room*



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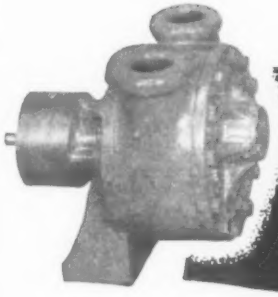

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TUTHILL *HIGH-PRESSURE* PUMP

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Write for complete Tuthill Catalog on pumps for production machinery and scores of wartime applications.

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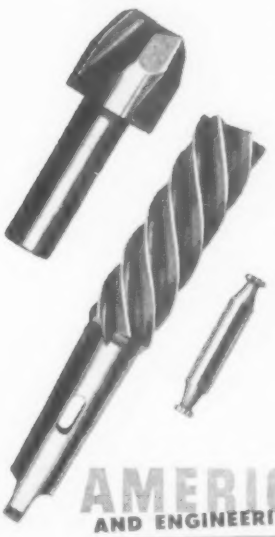
IT TAKES TEAMWORK TO WIN THE WAR

—and it's TEAMWORK that has made A. C. E. Special Cutting Tools tops in Workmanship and Accuracy



These are no production items that can run to thousands from one work-plan and machine set-up. No—they are special orders for limited quantities of a wide variety of types of cutting tools in many sizes—including reamers, milling cutters, counterbores, flat and circular form tools, tool bits, etc.

To handle such a variety of specials with speed and accuracy, it was necessary to establish close-knit cooperation of experienced engineering and drafting for work-planning, with skillful operation for machine set-ups and precision manufacturing, together with thorough inspection for every shop operation.

It is this teamwork we offer defense plants to cooperate in the war effort. Send us your inquiries for immediate quotation and quick delivery. Illustrated bulletin sent on request.

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31751 Mound Road, Warren, Michigan

AMERICAN CUTTER AND ENGINEERING CORP., WARREN, MICH.
SPECIALIZING IN HIGH SPEED CUTTING TOOLS TO YOUR PRINTS

ished at the number of address changes coming through the National office. During the 25 working days of December, 433 of these changes of address were recorded. Nearly 4% of our total membership has changed locations recently, and word of the changes reached the office during December. It will be great when our membership settles down and stays put, for each change of address requires seventeen operations (soon to be reduced) before we can be sure the member will receive all communications intended for him.

* * *

ASTE is a member of the American Standards Association. Our National Standards Committee Chairman, E. W. Ernest of Schenectady, and members of his Committee are working diligently to develop approved standards. Now comes word that new honors have come to an ASTE'r. Arthur M. Swigert, of the Ingalls Shipbuilding Corporation, Pascagoula, Mississippi, and a member of ASTE since 1938, has just been appointed to ASA's Sectional Committee on Classification and Designation of Surface Qualities.

* * *

Those of you who attended the War Production Conference in Springfield, last October, and saw the animated map will be glad to know that it has since that time visited Bridgeport, New Haven, Hartford, and Springfield, Massachusetts, and it is on its way now to Springfield, Vermont. This display map, showing the locations of the many Chapters and their groupings within Areas and Regions has caused considerable comment. It is the product of the imagination and initiative of New England Area Vice-Chairman of Publicity Kenneth F. Thomas of Hartford. He ships this around to Chapters on request—so far the New England Area—and with it go the four-foot letters, ASTE, which were on display back of the head table at the banquet.

* * *

Fort Wayne, Kansas City, and Decatur are galloping down the home stretch toward the goal of an ASTE Charter. January 28th will be the important day in KC and probably earlier that week will see Decatur's preliminary meeting. Fort Wayne will have its Charter Night soon. It looks as though we may close the fiscal year with fifty-eight Chapters, with several others "in the works."

* * *

Kenneth F. Thomas, New England Publicity Vice-Chairman, is campaigning with New England Chapters, urging each to construct a bulletin board 3' x 4' to be used at each Chapter meeting. He suggests that this bulletin Board be used as a means of displaying news items pertinent to Tool Engineers, from local papers, national magazines, and from the National Headquarters, as well as announcements of other committees in the local Chapter, dealing with membership standing and other Chapter activities. This certainly would be a good idea for each Chapter to adopt. The bulletin Board would probably become a focal point of interest during the Chapter meetings.

* * *

The list of technical speakers recently sent out to Chapter First Vice-Chairmen has been enthusiastically and gratefully received, judging from the nice "fan mail" pouring in to the Chapters Service Bureau at National Headquarters. One such officer writes,

(Continued on page 210)

SHIRLEY SCHAFER
Handles mail at National Headquarters.

Quick delivery from our large stock of standard die sets will help solve your production problems and the fine materials and workmanship in Detroit Die Sets assure you long and trouble-free service.

If today's shortages are affecting your output, write us regarding your problem. We are rendering valuable service to others. Maybe we can help you.

STANDARD DIE SETS in stock for immediate shipment

PRECISION DIE SETS • SPECIAL DIE SETS
ACCESSORIES in stock for immediate shipment
DOWEL PINS, SPRINGS, SOCKET-HEAD SET SCREWS and CAP SCREWS

Write for catalog

DETROIT DIE SET CORP.
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In War, as in Peace...

CERRO ALLOYS

SAVE TIME and CUT COSTS!

CERROMATRIX (Melting Temp. 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, short run forming dies and other metal-working applications.

CERROBEND (Melting Temp. 158° F.) Used as a filler in bending thin-walled tubing to small radii. Easily removed in boiling water. Also used for aircraft assembly jigs, templates for forming dies and other purposes.

CERROSAFE (Melting Temp. 190° F.) Used to accurately proof-cast cavities such as molds, gun chambers, forging dies, etc. and for many similar applications.

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DETROIT, MICH., Castaloy Metal Sales Company.
HOUSTON, TEX., Metal Goods Corporation.
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LOS ANGELES, CAL., Castaloy Metal Sales Company.
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MINNEAPOLIS, MINN., Northern Machinery & Supply Co.
MOLINE, ILL., Sterling Products Co., Inc.
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STANDARD MORSE TAPER No. 2 TO 6 IN STOCK

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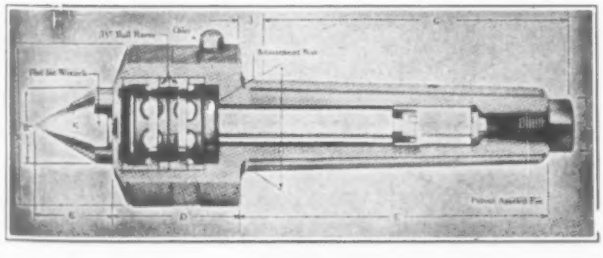

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Single-Point DIAMOND•TOOLS

While octahedron diamonds give entire satisfaction for truing and dressing of most grinding wheels, "Ready-Set" Diamond Tools, containing an elongated stone that may be completely consumed without resetting, may be profitably used on certain operations. Catalog on request.

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SECOMET Resinoid Bonded Diamond Wheels can do your work more accurately, faster and without appreciable wear. They are most economical for sharpening cemented carbide and multi-bladed tools, such as milling cutters, broaches, etc. Moreover, their sharp, free-cutting action eliminates lapping and the usual semi-finish grinding operation. Catalog on request.

Prompt deliveries

J. K. SMIT & SONS, INC.
157 Chambers Street, New York

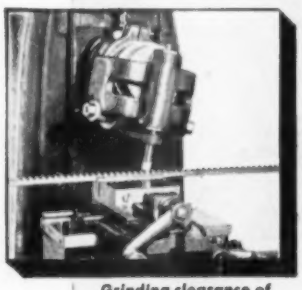
"While it must have been a gigantic task to prepare such a list, I am sure the Society as a whole will benefit greatly by your efforts." Chapter Committee Chairmen, Chapter Officers, and Regional Directors have requested copies of material being distributed by the Bureau.

The Speakers List is a preliminary one for temporary use until the completion of the Speaker Portfolio. Research is being continued and progress being made despite reluctance on the part of some speakers to commit themselves to distant engagements, because of limitations of time and travel restrictions. We are securing the co-operation of some fine technicians from important companies, who seem pleased to have an opportunity to work with us. One, who responded favorably, said, "We very much appreciate the opportunity of getting on your records and hope that we will be able to deliver helpful talks to the chapters." Truly, ASTE is finding a place in the sun.

* * *

Comes word that anyone wanting a nice souvenir to give away at a Chapter meeting can secure playing cards bearing the ASTE emblem for 50c per deck (plus postage). Write to Henry A. Rockwell, 317 S. Main Street, Manchester, Connecticut, Second Vice-Chairman of Hartford Chapter. Available only to ASTE Chapters.

LIBERTY High Speed Grinding Attachments



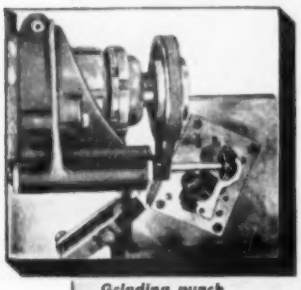
Grinding clearance of broach teeth.

Grinding gage in perfect alignment with other points.

Both horizontal and vertical types are easily attached to most surface grinders for grinding angles, slots, recesses and surfaces which are impossible to reach with large grinding wheels.

For extremely accurate grinding on gages, tools, dies, etc. Assembled complete with any size bores, pulleys, belts and grinding wheels at no extra cost.

***Write for details* — specifying diameter of spindle head, type and make of grinder.**



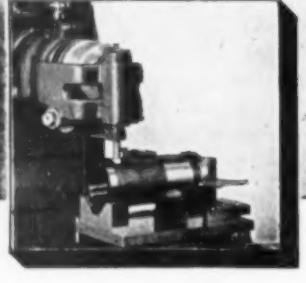
Grinding punch form.

Grinding shoulder on punch.

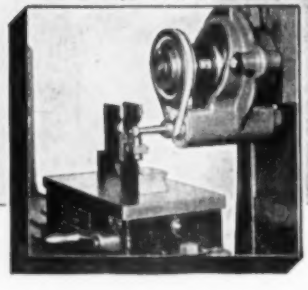
LIBERTY TOOL & GAGE WORKS

235 Georgia Ave. Providence, R. I.

Grinding rectangular opening in trigger casing.



Grinding gaging seat on special gage.



To Frank A. Hart, member of Greater New York Chapter 34, have come new honors. Word has reached the National Office that he is now Vice President and General Sales Manager of the Lombard Governor Corporation whose plant is located at Ashland, Massachusetts. Mr. Hart became a member of the American Society of Tool Engineers in March, 1940, when he was Chief Tool Designer for the Sperry Products Company. He is a graduate of the General Electric course at Schenectady and has been in the tool business as toolmaker, designer, tool engineer, and salesman since 1919. The Lombard Governor Corporation, producer of hydraulic governors for controlling turbines, is also manufacturing gun mounts, machine tools and, like other manufacturers, is doing its utmost to contribute largely to the successful prosecution of the war effort.

* * *

Decision to present the Production Front Edition of the A. S. T. E. Machine Tool Progress Exhibition in conjunction with the Annual Meeting in Milwaukee next month was made by the National Executive Committee, meeting in the Lakeside city January 17, with the Milwaukee Convention Committee.

Of interest to convention-going A. S. T. E. members will be a School for Chapter Officers, to be held Saturday afternoon, March 27. The same evening will witness the Annual Banquet, to be held this year in the Schroeder.

Active planning for the convention was relinquished by Chairman William Iekel, of the Milwaukee Chapter, who is now employed in Chicago. The new chairman is Lawrence Radermacher, First Vice-Chairman of the Milwaukee Chapter. Sub-Chairmen appointed to date include Harold Heywood Technical arrangements; Redmond Bliss, Program; Ray Nauertz, Banquet; Henry Petersen, Entertainment; Julius Riedl, Publicity; Regional Director, Eugene Bouton, Attendance.

Chairman Lawrence Radermacher, of the Milwaukee Convention Committee, predicts success for the Machine and Tool Progress Exhibition. Radermacher reports that requests already have been received for many of the exhibit spaces.

THE END.

NEW BOOKS

A Course in Powder Metallurgy by Dr. Walter J. Baeza, Reinhold Publishing Corporation, 330 W. 42nd St., New York. This book is said to be written for a fast-developing field. It may be divided into three sections: (1) The history of powder metallurgy and laboratory and plant processes are covered, with the theory underlying the processes clearly described. This section serves as a source book for instructors and as a text for students. (2) Practical suggestions for assigning experiments, in which a minimum of equipment serves a maximum number of students are contained there. (3) This section outlines 15 experiments, describing the object, procedure and equipment of each, indicating its significance and relation to the theories discussed earlier.

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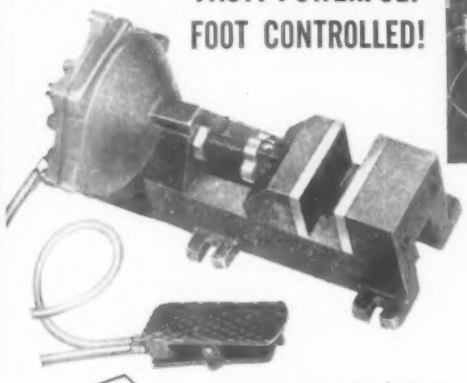
FOOT CONTROLLED!



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HAND FREE OPERATION!

• Foot operation leaves BOTH hands free for fast insertion and removal of work. Vise stays open or closed without constant foot pressure.

Most important vise design in years! A fast-action, hard gripping air vise that speeds production; saves time, labor and costs! Speedy Air Vise operates from air line or individual compressor, exerting a grip of 15 times air pressure! Jaw opening adjustable up to a maximum of 3 inches. Maximum travel of ½ inch assures rapid insertion and removal of work. Employs no piston, but instead a long-life, multiple-type diaphragm . . . eliminating friction loss, air leakage and slippage. Rugged, compact, low priced, it is the ideal vise for speeding up numerous operations.

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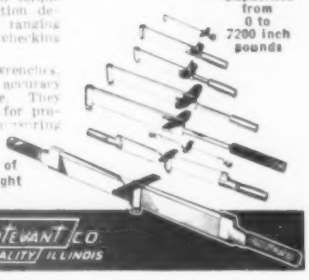
Torque Wrenches are used in leading industrial, automotive and aircraft plants to control the set of screws and nuts in production departments . . . to measure and test applied torque or resistance in laboratories and inspection departments — and for innumerable jobs ranging from building delicate instruments to checking frictional drag in giant diesel motors.

Built by the pioneer in accurate gauging wrenches, they are more accurate. They retain their accuracy permanently. Practically indestructible. They have brought to industry a new means for production control and for gauging and measuring torque in its thousands of applications.

SIZES — Capacities from 0 to 7200 inch pounds



Write for Bulletin describing use of STURTEVANT Wrenches at Wright Aeronautical Co.

PA STURTEVANT CO.
ADDISON QUALITY ILLINOIS

Your tap has outlasted any others which we have used

EXCERPT FROM CUSTOMER'S LETTER

A spinning finger of polished steel . . . cutting delicate chip curls . . . a thread is formed, accurate and true to the thousandth of an inch . . . dozens of threads, hundreds of threads, thousands of threads . . . a Threadwell Ground Thread Tap is setting new records for "holes per tap" *somewhere on the production front.*

In our files are dozens of recent letters of thanks that fall into two groups . . . letters from *purchasing* men in appreciation of the *personal attention* their orders for taps have received from Threadwell and its distributors, and letters from *production* men telling us how well our taps have performed in high speed tapping machines.

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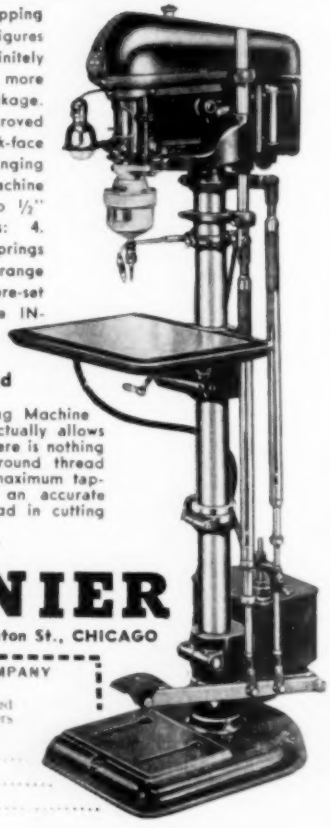
Hundreds of users of Procunier Tapping Machines will give you day-by-day figures proving that these machines definitely speed up tapping operations, do more accurate work and reduce tap breakage. There are reasons why: 1. The improved tapping head with double-cone cork-face friction clutch. 2. Four speeds, ranging from 390 to 2050 RPM. 3. One machine handles tap sizes from No. 2 to ½" through two interchangeable heads: 4. Extra long Spiral Compensating Springs conveniently located, with wide range hand screw adjustments, maintain pre-set tap feeding and reversing pressure INDEPENDENT OF OPERATOR.



Tap Establishes Its Own Lead

The new Procunier Universal Tapping Machine is exclusively designed so that it actually allows the tap to establish its own lead. There is nothing more accurate than a precision ground thread tap as a guide for tapping — so maximum tapping efficiency is attained where an accurate tap is free to establish its own lead in cutting the thread.

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TIME SAVERS in ANY PLANT
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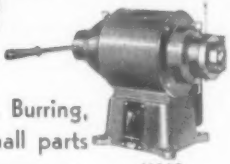
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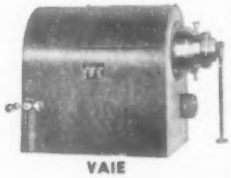
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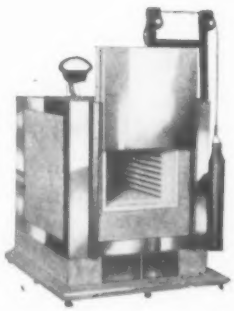

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When you change from steel dies to WILLEY'S DIES, as illustrated, production goes up — costs go down. In the vital production of small arms ammunition and cartridge cases, Willey's Dies are proving their worth in many war production plants.

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★ In conjunction with your gage blocks, Acme Optical Flats and Monochromatic Lamp make light - wave measurement simple and easy.

Where glass optical flats are used to determine surface flatness, or where they are used for comparison measurement in connection with precision gage blocks, light of a single wavelength is required. This is provided by the Acme Monochromatic Lamp. Its large bright working field avoids the necessity of exact placement of the work, and makes inspection easy and fast. Interference bands can be seen on a relatively dull surface or through an appreciable air gap. This decreases scratching and wear of your glass flats as it is unnecessary to rub them down on the work to squeeze out the air film.

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Accurate, High-Speed **MOREY VERTICAL SHAPERS**

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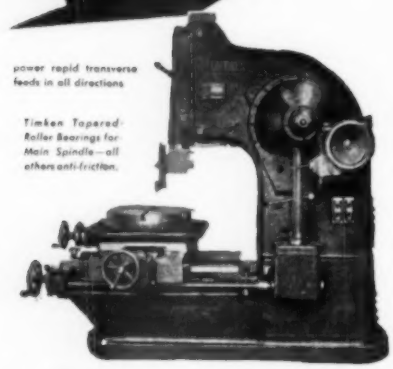
power rapid transverse feeds in all directions
Timken Tapered Roller Bearings for Main Spindle—all others anti-friction.

Built to highest accuracy standards the MOREY VERTICAL SHAPER is simple for tool-room manufacturing. Power feeds and power rapid transverse feeds in all directions are instantly available in all operating positions.

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Will Not Spall!
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PRODUCTION MACHINES FOR A WIDE VARIETY OF APPLICATIONS.

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INTERNAL

GRINDER

An exceptionally wide range of internal grinding jobs can be handled on the New Majestic Internal Grinder. Its simplicity of design and ease of operation are features of utmost importance in providing maximum grinding output at low cost.

SPECIFICATIONS

Length of table, 48". Swing over table, 10". Travel of cross slide, 2½". Precision dial graduated to .0001". Precision bearing work head. Speeds—100, 225, 350 r.p.m.

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Cams cut to your layout shipped within 2 to 3 days.

Set of 3 No. 00 Cams including blanks, cutting, heat treating — $6.20 complete. Other sizes in proportion.

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Uniform clean-cut knurling always

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THE PASSING PARADE . . . .

T.M. REG. U.S. PAT. OFF.

The Ever-Changing Scene in Mass Manufacturing

T. C. FOCKLER of the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., has been appointed a member of the American Standards Association's Subcommittee on Ball and Roller Bearings and Standardization of Shafting.

ALBERT C. DELMONT was recently appointed Research Director of the newly organized research and laboratory departments of the Douglas T. Sterling Company of Stamford, Connecticut.

WM. B. McBRIDE, with the Bell Aircraft Corporation since 1940, has recently been appointed to the position of production manager of that concern, it was recently announced. Mr. McBride succeeds **MR. M. E. ROE**, who is devoting his attention to problems in the tool engineering division of the company.

WM. B. McBRIDE
Bell Aircraft production head.

J. D. SHAW, formerly research and production engineer with Metals Disintegrating Company, has joined the organization of Aircraft Parts Development Corporation at Summit, New Jersey as powder metallurgist, it was recently announced.

O. W. TRUMBULL was recently appointed vice president and general manager of Greene, Tweed & Company of New York.

GEORGE G. HATHAWAY has resigned as sales manager of the International Machine Tool Corporation, it was recently announced. **MR. HARRY W. HEIDERGOTT**, who has been with this concern for many years, will take over the duties as sales manager.

K. L. CRICKMAN, St. Louis district manager for the Carpenter Steel Company of Reading, Pa., will direct the operations of that concern's new district warehouse which will be located at 712 Cass Avenue, St. Louis, Mo.

C. V. "CLETE" BRINER
Changes work in Cleveland.

C. V. "CLETE" BRINER, Sales Engineer at the Cleveland office of Pratt and Whitney for a number of years, has recently accepted a position with the Pipe Machinery Company, also of Cleveland.

(Continued on page 218)

Eliminate Hardening Distortion
Drill AFTER HARDENING with "HARDSTEEL" Drills

Wherever distortion during hardening of drilled steel parts throws drilled holes out of round or out of line—change your shop practice. Harden the part—then drill with "HARDSTEEL" without annealing, as is being done on the airplane crankshaft illustrated. Speed up your drilling—cut your rejects—insure perfect matching at assembly.

"HARDSTEEL" drills work with ease in steels hardened by any process and also the work hardening types. The harder the material—the easier it is to drill, countersink and counterbore.

"HARDSTEEL" grinds quickly on any ordinary wheel—saves time—and drills can be reground many times.

Learn all about the drilling of hardened steels and steel parts. Ask for the "HARDSTEEL" operator's manual—no charge.

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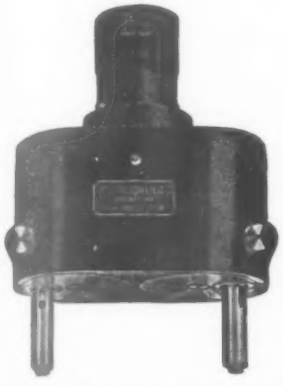
"HARDSTEEL"
DRILLS · REAMERS · TOOL BITS · SPECIAL TOOLS

U S
HEADS
STANDARD SINCE 1915



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All Types of Fixed Center Heads

UNITED STATES DRILL HEAD CO.
Cincinnati, Ohio

"Ceiling on Grades- Not Quality"

A HOT WORK STEEL FOR EVERY PURPOSE

VINCO HOT WORK (HIGH TUNGSTEN TYPE)
T-ALLOY (INTERMEDIATE TUNGSTEN TYPE)
PRESSURDIE #1 (CHROME-TUNGSTEN TYPE)
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PRESSURDIE #3 (CHROME-MOLYBDENUM TYPE)

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"The Tool Steel Mill"
BRAEBURN, PENNSYLVANIA

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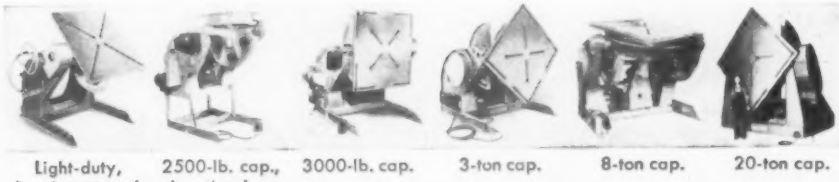
We'll hold it while you weld it...

IF you're doing a welding job on war production, you can get Ransome Positioners to help you increase your output and reduce costs.

With this modern equipment, your welders can readily swing the heaviest and most complicated pieces for a downhand position on every pass . . . top, sides, and bottom, with one set-up.

Made in a complete range of types and sizes . . . hand-operated and motor-operated . . . up to 20 ton capacity . . . there's a unit that will fit your needs exactly.

● *Write for literature showing how Ransome Positioners can solve some of your major welding problems.*



Light-duty, hand-operated | 2500-lb. cap., elevating base | 3000-lb. cap. | 3-ton cap. | 8-ton cap. | 20-ton cap.

Ransome WELDING POSITIONERS
INDUSTRIAL DIVISION • RANSOME MACHINERY COMPANY • DUNELLEN, NEW JERSEY

Very active in the American Society of Tool Engineers, Mr. Briner was chairman of the Cleveland Chapter in 1940 and 1941. He is now a national director of the society. Attending Ohio State University, Mr. Briner served in the United States Army in World War I and at the time of his discharge held the rank of lieutenant.

RICHARD E. PALMER, formerly in the aircraft division of the War Production Board, has been appointed assistant to O. L. Woodson, vice president and assistant general manager of the Bell Aircraft Corporation, it was announced recently.

PETER N. JANSEN, formerly director of manufacturing in the airplane division of Curtiss-Wright Corporation, has been named general manager for the airplane division and placed in charge of all airplane manufacturing plants. **J. P. DAVEY** has been appointed as general manager of the company's plant in Columbus, Ohio.

WM. JAMES RUSSELL, manager of engineering for the Westinghouse Electric Appliance Division at Mansfield, Ohio and **SAMUEL W. CHANTLER,** superintendent, and **PERCY N. LOVE,** industrial relations supervisor of the Canton, Ohio Division of the Westinghouse Electric and Manufacturing Company, have been awarded the Westinghouse Order of Merit for their achievements in speeding war production.

ARNOLD W. NELSON was recently appointed as district representative for Allegheny Ludlum Steel Corporation in the Minneapolis territory, and **ROBERT H. GIBB** has been appointed district manager of the Pittsburgh district office of the same concern, it was recently announced.

DIED

HENRY C. PIERLE, secretary and general sales manager of the R. K. LeBlond Machine Tool Company of Cincinnati, died January 14th at Christ Hospital following a heart attack and

HENRY C. PIERLE
With LeBlond 32 years

short illness of several weeks. 62 years old, Mr. Pierle received his engineering training at the Technical School and University of Cincinnati. He began work as a machine shop hand, being employed in turn by Lodge & Shipley Machine Tool Company, the Cincinnati Bickford Tool Company, and the R. K. LeBlond Machine Tool Company. Associated with the LeBlond Company for 32 years, he has been sales manager since 1918. Mr. Pierle was past secretary of the National Machine Tool Builders' Association.

CHARLES C. SWIFT
Was president of 2 concerns.

CHARLES C. SWIFT, president and treasurer of The Ohio Machine Tool Company, Kenton, Ohio, died on January 10, 63 years old at the time of his death, Mr. Swift had been associated with the concern since 1911. He was also president of The Swift Welder Company, Detroit and a director of The Cleveland Punch and Shear Works.

THE END.

Speed Production Thru Education of Personnel

This Amazing Chart Makes Trigonometry Easy

BREAK THE BOTTLENECK

Machine Shop — Tool Die — Jig Bore — Patterns — Layout — Inspection — Drafting

⅔ **ACTUAL SIZE**—TRIG-EASY is pocket size. Handy. Point arrow to unknown quantity, and correct equation appears in window. Right triangle equations on reverse side.

40 TRIGONOMETRIC EQUATIONS are quickly found on the TRIG-EASY CHART which eliminates all errors through use of wrong equations. Angles and dimensions are determined without a knowledge of higher mathematics.

Makes TRIGONOMETRY *Easy*

The TRIG-EASY CHART quickly gives you the answer on jobs requiring machine surfaces, holes drilled at angles, etc. On every job, where angles and dimensions are different, a lot of time is wasted waiting for someone to calculate how to set up the job.

With this amazing TRIG-EASY CHART, every man whose work requires a solution of problems involving angles, will save his time and time for those who must wait for needed calculations.

TRIG-EASY makes Trigonometry easy and breaks the time-wasting bottlenecks. You save calculating time with instant correct equations. TRIG-EASY pays for itself in time saved, every time it is used.

Handy vest or shirt pocket size. Grease-proof and sturdy to resist moisture and dirt. Over 18,000 in use by many of the largest concerns in U. S. and Canada.

TRIG-EASY costs only 50c with complete instructions and MONEY-BACK GUARANTEE. You can speed production thru education of personnel. Send for your TRIG-EASY CHART today.

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TRIG-EASY

Dept. M. Culver City, Calif.

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GROB
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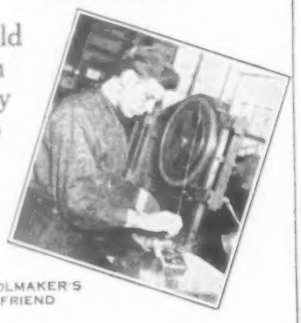
NO SAW WELDING
INSTANT INTERNAL SAWING

Should Be In Every Shop



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Unsurpassed in speed, efficiency and accuracy of sawing small and medium sized dies as well as miscellaneous parts.

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GRAFTON WISCONSIN

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Lincoln 1988 — Lincoln 1966

Reg. U.S. Pat. Office

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The Tag-O-Graph Jr. is a proven product for saving time and money. Prevents errors. Useful in various Departments of your plant. For use in your shipping dept. If you require tags or labels addressed in quantities, use Tag-O-Graph Jr. Will print on paper, wood, cloth, boxes, leather, etc. Prints as many as nine lines. Print handwriting or typewriting. Nothing to wear out. Lasts a lifetime. Simple to use. Will address about 80 tags per minute.

Comes complete with all supplies, including a can of waterproof ink and 25 stencils.

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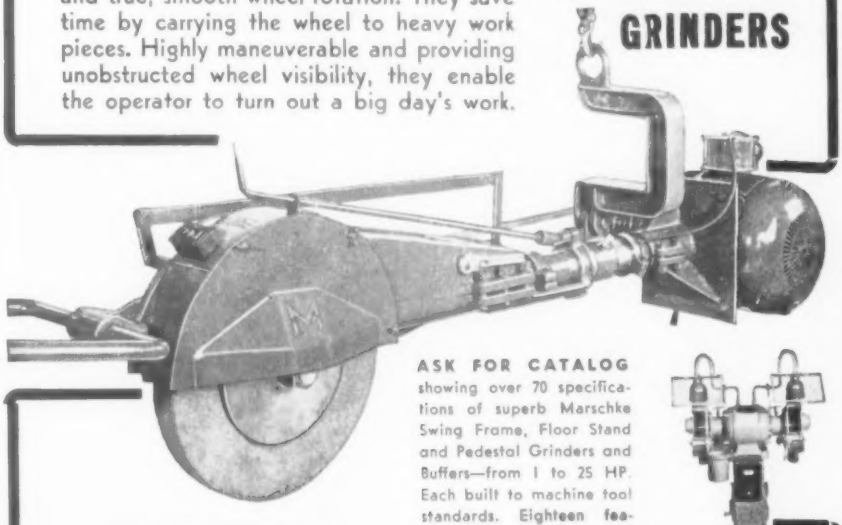
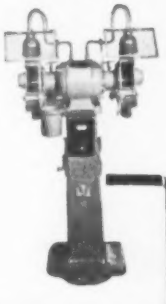
MARSCHKE SWING FRAME GRINDERS

MARSCHKE Swing Frame Grinders get more work out of expensive abrasive wheels, ***cut offhand grinding costs,*** because they give three correct, controlled wheel speeds and true, smooth wheel rotation. They save time by carrying the wheel to heavy work pieces. Highly maneuverable and providing unobstructed wheel visibility, they enable the operator to turn out a big day's work.





ASK FOR CATALOG showing over 70 specifications of superb Marschke Swing Frame, Floor Stand and Pedestal Grinders and Buffers—from 1 to 25 HP. Each built to machine tool standards. Eighteen features of superiority to give long dependable service under toughest, grittiest operating conditions. Write today.

THE MARSCHKE LINE
VONNEGUT MOULDER CORPORATION
1820 Madison Ave. Indianapolis, Ind.

INTRICATE COMPRESSION DIE

Made in 3-operations . . . .

CASE HISTORY No. 8: After the blank is bored and the design scribed on its surface — a roughing and finishing cut is made with the SLOTMASTER. The finish cut is held to one and two thousandths, and so accurately done, it was found that when checking the die by rotating the lapping punch from position to position, it could be pressed through the die in any position . . . The lapping operation requires a man's time only for set-up. It is started by lowering the punch to the mouth of the die opening and then setting the down stroke of the Slotter so that it will completely compress the coil spring. As the spring relaxes, the punch works its way through the die as a result of the spring pressure and the stroking of the Slotter.

SLOTMASTER can be used on any round or flat-on round over-arm milling machine and will do precision work that normally requires a multi-thousand dollar machine (all of the working parts are of tool steel, heat treated). It takes but little time to change over from one head to the other . . .the stroke of the ram is adjustable from 0 to 4" . . .the speeds range from 50 to 250 s. p. m. The tool holder is of the clapper box type and can be turned in any position. SLOTMASTER comes complete with pulleys, motor, mounting bracket, etc.

Send for 4-page catalog — give specifications of the milling machines you wish to equip. Immediate deliveries on high priorities.

EXPERIMENTAL TOOL & DIE CO.
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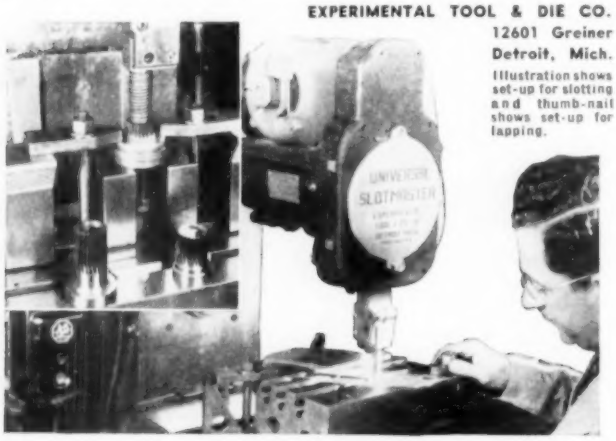
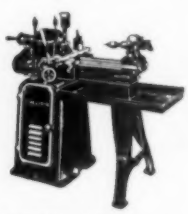


Illustration shows set-up for slotting and thumb-nail shows set-up for lapping.

SHELDON Back Geared Screw Cutting PRECISION LATHES

For the Tool Room

The finest 10", 11" and 12" lathes ever built in the moderate price field. Large special analysis steel spindles GROUND ALL OVER, with extra collet capacity. Hand-scraped Bronze, Ultra-Precision Ball or Super Precision Roller spindle bearings, (the finest bearings obtainable). Heavy braced, semi-steel beds with hand scraped ways (2 V-ways and 2 flat ways). These lathes come with a choice of aprons, gear boxes, and drives including the anti-friction, 4-speed, V-belt Lever-operated pedestal base motor drive illustrated. Telescopic Taper Attachment and other accessories available.



For Production

Sheldon Lathes will stand up to any production work within their capacity—are ideal for second operation work. Production models available with any or all of these features: Ultra-Precision Ball or Super-Precision Roller spindle bearings. Lever-operated Collet Attachment, Lever-operated Tail Stock, Lever-operated cross slide with double tool post, Lever-operated turret, etc.

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Both Bench and floor, models with choice of Semi-quick or Full-quick Change Gears, Plain Aprons or Worm Feed Apron with Power Cross Feed. Overhead, Back or Underneath Motor Drives—Telescopic Taper Attachments, Tool Post Grinders, Milling Attachments and all standard accessories.

Write for Catalog and name of nearest distributor.

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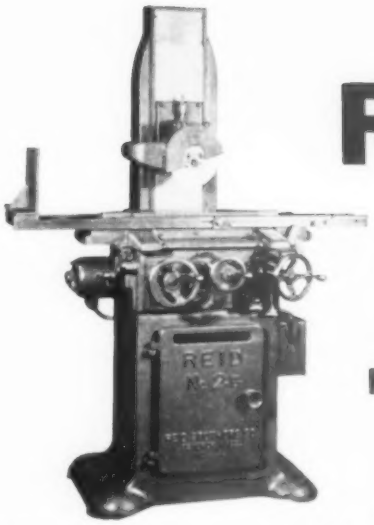

THE REID 2B

All Electric Automatic and Hand Feed Surface Grinder

A PROVEN PRODUCT FOR OVER A QUARTER OF A CENTURY

THE Reid All Electric Surface Grinder is equipped with a motorized spindle, thereby eliminating all belts, pulleys, and counterweights. Table and cross slide are equipped with oil rollers, insuring greater life and proper lubrication. Table is operated with a silent chain instead of rack and pinion gears. Grinding capacity 6 x 18 x 11. Additional height if required on all standard machines. Send to Dept. O. for descriptive literature.

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Built for hard tough work — die cannot lose alignment with punch — all parts interchangeable.

Capacity ½" *holes* through $\frac{3}{16}$" steel; $\frac{7}{16}$" through ¼" steel. Can also be made for holes up to $\frac{13}{16}$" in thinner metal. Stock punches and dies available from $\frac{1}{16}$" to ½" by 64ths.

Weight, 70 lbs.

PRICE WITH ONE PUNCH AND ONE DIE—

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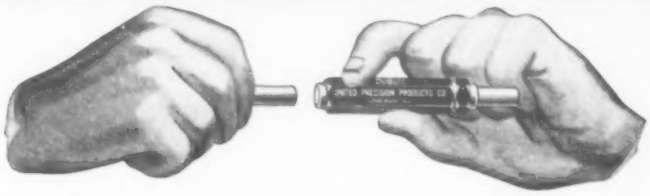

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Both "Go" and "No Go" ends of DUBLIFE Gage are reversible. Turn end for end, and you have NEW Gage! Plug secured in handle by bronze tapered collet. ***Twice the precision life.*** Accurate long after other gages are worn.

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FULL AUTOMATIC CONTROL

INTERNAL OR EXTERNAL RIGHT OR LEFT — UP TO 7 INCH DIAMETERS
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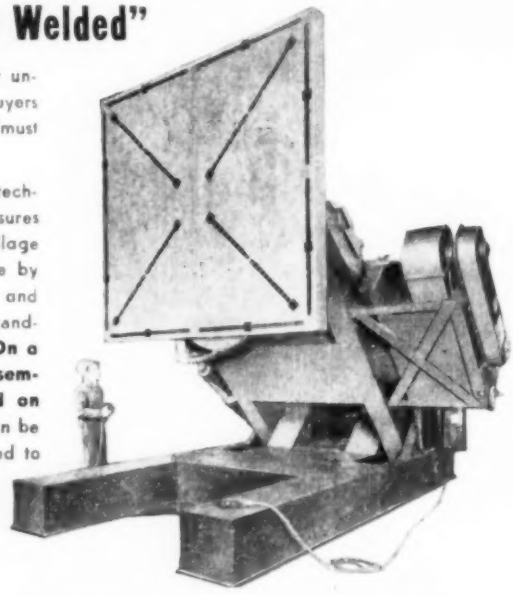
Today's specifications read . . . .

"Must be Positioner Welded"

To guarantee flawless welds, stronger unions and smoother, cleaner fillets, buyers of welded products today specify, "must be position welded."

The greatest advance in welding technique, position welding, not only assures a better product but reduces spoilage and rejects, cuts actual welding time by permitting the use of larger rods, and cuts crane, crane crew and welders handling and set-up time to a fraction. **On a C-F Positioner weldments and assemblies can be welded down-hand on ALL sides with a single set-up;** can be revolved completely around and tilted to



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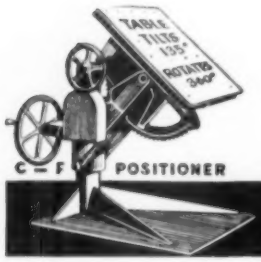

any point up to 135° from horizontal. C-F Positioners come in capacities from small hand operated positioners to large variable speed giants that twist and turn 30,000 lb. weldments under push button control.

CULLEN-FRIESTEDT CO.,
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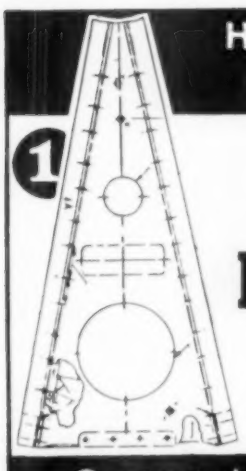

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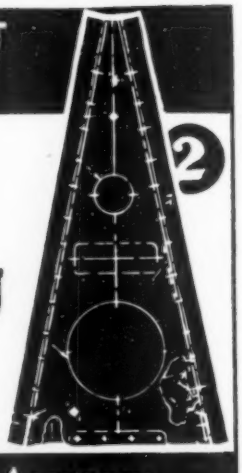

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(A War Production Affiliate of Cleveland Shopping News)
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FEBRUARY MEETINGS

BINGHAMTON — February 3. 7:30 P. M. Arlington Hotel. There will be an election of chapter officers and the showing of two films, "Heat Treating Hints" and "Induction Heat Treating."

NEW YORK — March 1. 6:30 P. M. Hotel New Yorker. Technical session at 8:15 will feature a talk by H. Goldberg, R. G. Haskins Company, on the many phases of taps, tapping and tap sharpening. There will be an actual demonstration on machine set-up at the meeting.

PROVIDENCE — February 15. Sheraton Hotel. This meeting is restricted to members for the election of chapter officers and the discussion of plans for 1943.

ROCHESTER — February 10. 6:15 P. M. Hotel Sagamore. The main business of the meeting will be the election of chapter officers. Motion pictures will also be shown. Reservations: C. G. Newton — Tel. Stone 2893.

ROCKFORD — February 4. 7:15 P. M. Hotel Faust. The election of chapter officers will be held and two motion pictures will be shown, one, "Unfinished Rainbows," is a sound picture in natural color dramatizing the story of aluminum. Reservations: Allis Chalmers, 510 Gas-Electric Building, Tel. Main 6270.

(SPRINGFIELD, VT.) Twin States Chapter, February 11. 7:30 P. M. Masonic Temple, Windsor, Vt. Mr. Herman Zorn, Vice President of the V. & O. Press Company, Inc., will talk on "Presses Geared for Defense."

WINDSOR, ONTARIO—February 8. Chapter officers will be nominated at the meeting.

A.S.M.E. 1943

NATIONAL MEETINGS

SPRING MEETING
- Davenport, Iowa, April 26 - 28

SEMI-ANNUAL MEETING
- Los Angeles, Cal., June 12 - 14

ANNUAL MEETING
- New York City, Nov. 29 - Dec. 3

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Cutting Tool Project Engineer

Man must have good knowledge of Milling cutters and end mills, both from standpoint of design and knowledge of cutting characteristics of variety of metals, and metallurgy. Progressive company located in central New England, and job has excellent post war potentialities. Write Box 761, THE TOOL ENGINEER.

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TOOL ENGINEER, for Connecticut plant manufacturing punched and machined metal products. Give age, education, experience, reference and salary expected. Box 760, THE TOOL ENGINEER.

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Photo courtesy Minneapolis-Honeywell

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Without Dies

Users of Di-Acro Precision Machines—Shears, Brakes, Benders—are constantly showing us new time-saving, cost-cutting applications, in experimental work, for making small quantities of parts—or even production runs. They often save Man Hours and Critical Materials. **Die-less duplicating** does many things dies cannot do.

Photo shows Di-Acro Shear No. 1, which squares up stampings, cuts strips, makes slits or notches. All work accurate to .001".

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It shows Di-Acro Shears, Brakes, Benders, illustrates many parts which can be made with this creative, flexible system of "Metal Duplicating Without Dies".

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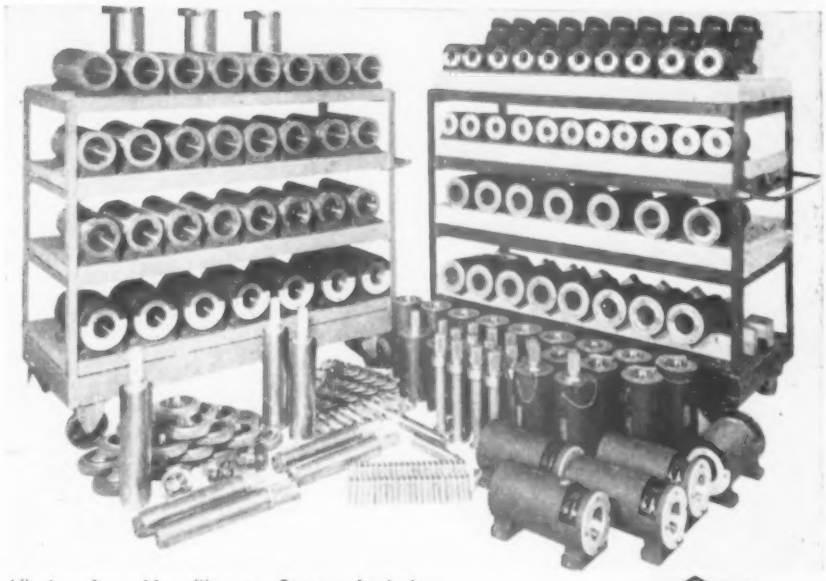

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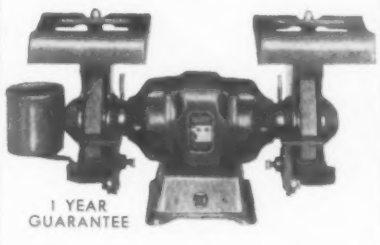
BALL BEARING **GRINDERS**

Built For Heavy Production Service



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and 4¼"
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14 x 36" Norton Plain, M.D.
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No. 77B Niagara Dble Crank

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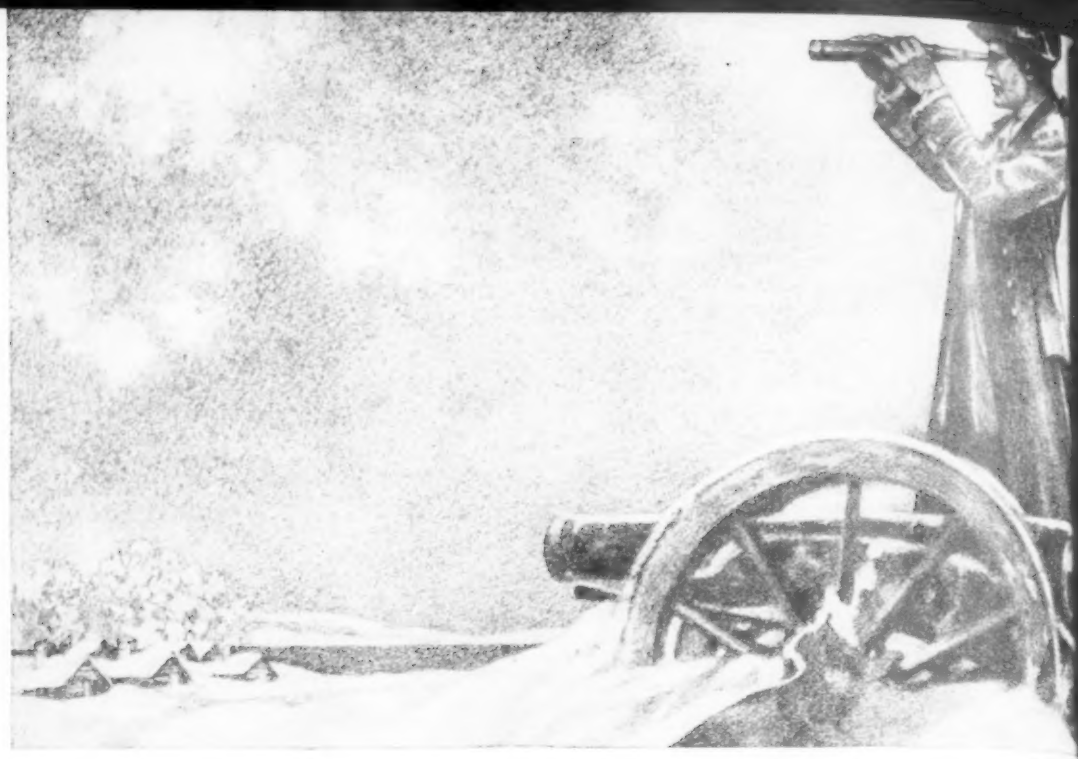
546 Second Ave. Detroit, Mich.



VALLEY FORGE was a For

IT is significant that one of the most inspiring names in American history is the name of a forge—Valley Forge. For the scene of the "Gethsemane of the American Revolution" took its name from an iron furnace, operating an early type of forging hammer, situated in the beautiful Pennsylvania hills that shelter the winding Valley Creek to its juncture with the Schuylkill River.

In that dread winter of 1777, the spirit of our forefathers, like the iron on the anvil of the forge in the valley, was beaten and forged by the hammer blows of adversity, privation and want, into the tough unyielding metal of independence.

That is the virtue of forging—of *drop* forging in particular. It gives maximum tensile and torsional strength because of controlled grain flow and distribution of metal. Safety through concentration of grain structure at points of greatest shock and strain, and high resistance to fatigue are qualities that only forging can give.

The drop forgings that are being produced in ever increasing quantities on Chambersburg Hammers for the vital war needs of the United Nations are a symbol of the spirit of America today, hammered and toughened into unbreakable resistance on the Valley Forges of adversity and in the fires of self-imposed discipline.

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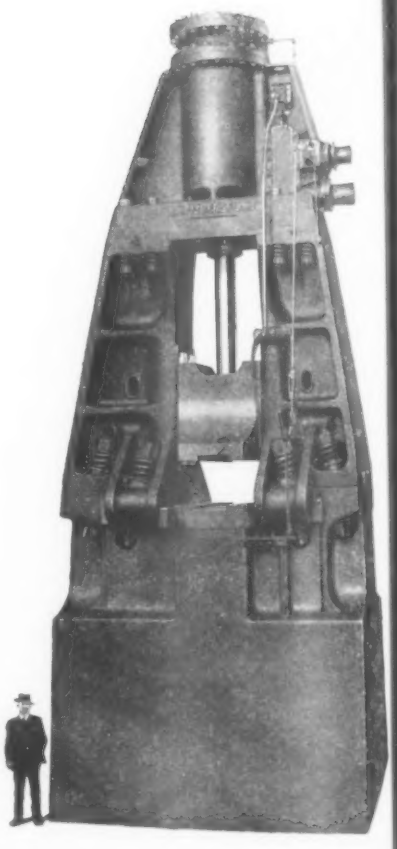

The giant mechanism shown above is a Chambers-burg steam drop forging hammer—modern successor to the hammer in the Valley Forge of 177[illegible]. Like its predecessor, this Chambersburg hammer is forging munitions of war . . . vital parts that make up the modern tank, airplane, machine gun, and all the other equipment that depend on drop forgings to "withstand the unpredictable" stresses and

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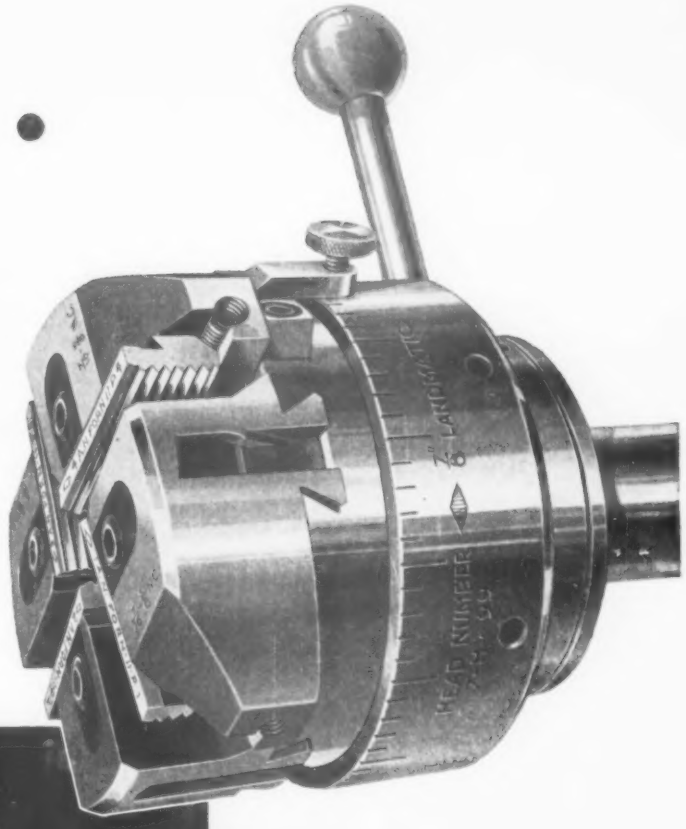

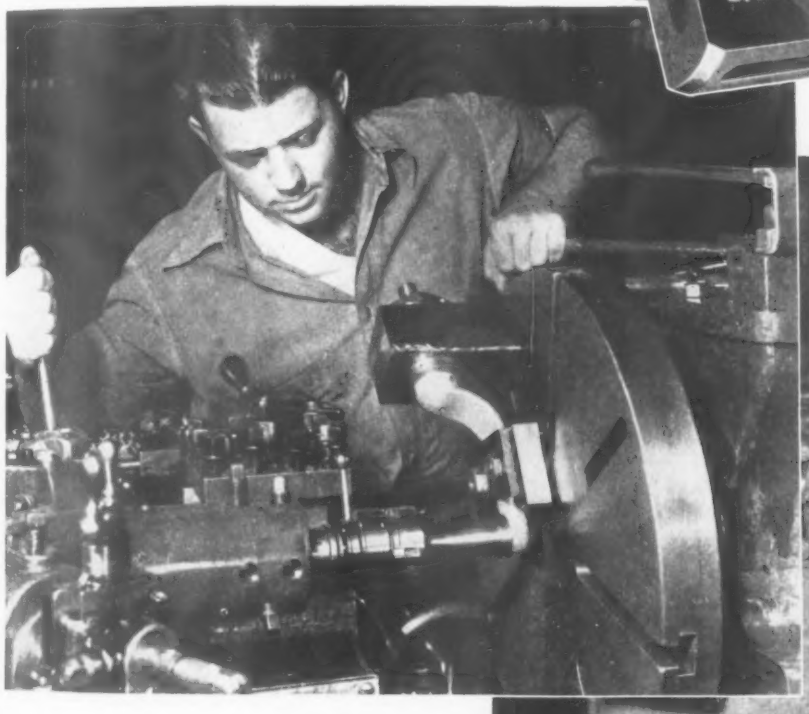

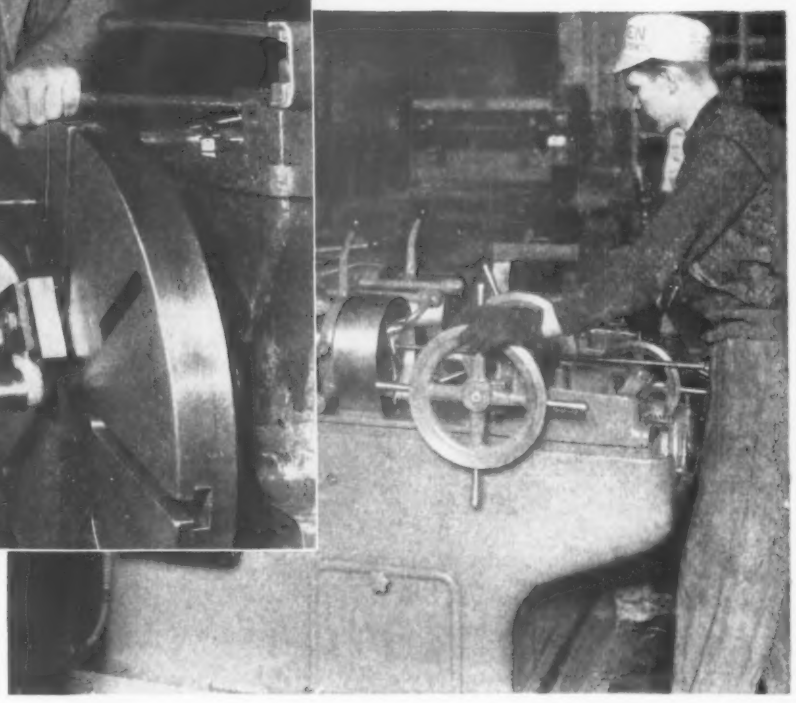

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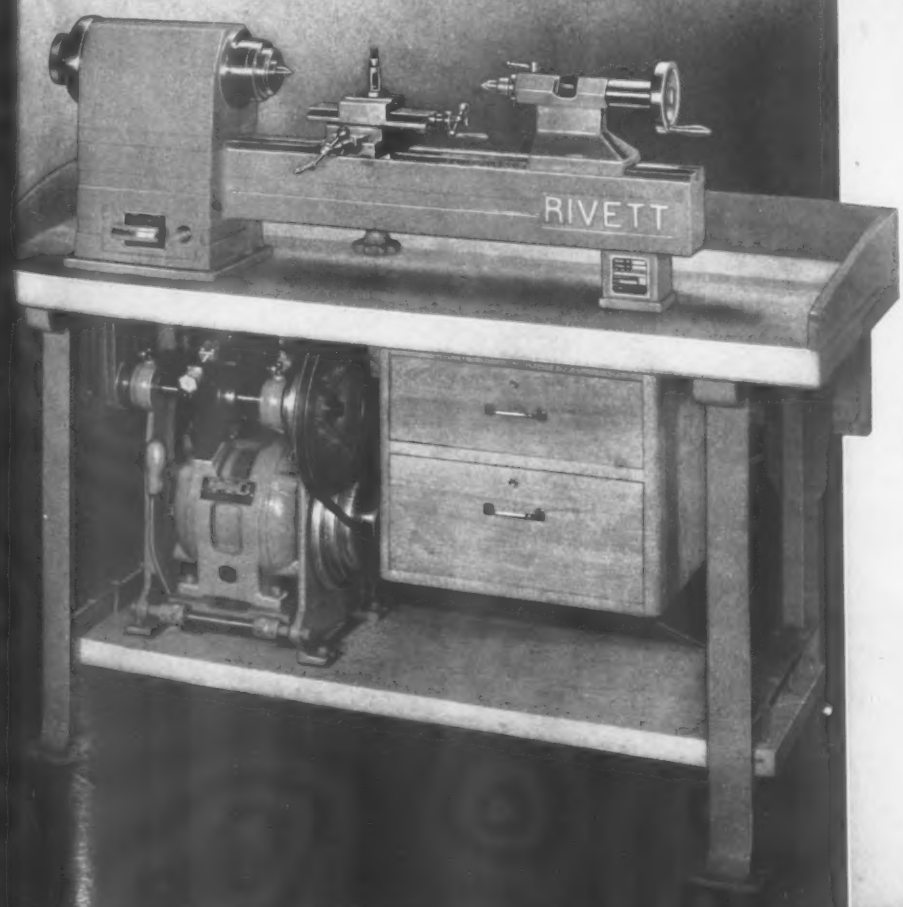
Re[illegible]lutionizes Concept of Bench Lathe [illegible]y Its Power and Vibrationless Performance

Th[illegible]ivett No. 918 has been developed to advance the productive [illegible]pacity of the plain precision bench lathe. Not only is it indis[illegible]nsable in the tool room and in light manufacturing, but it is c[illegible]able of thousands of jobs often produced on heavy, costly mac[illegible]nes. It has exceptional power, wide speed range, vibrationless [illegible]erformance; it is quickly set up, fast, accurate and trouble proo[illegible]

Operating convenience and long-life precision are well blended in the No. 918 design. Ball bearing spindle is mounted in rugged headstock enclosure supported by heavy box sectioned bed. Long taper key-drive spindle nose assures true running and positive drive for chucking attachments. Shoe mounting automatically squares compound slide rest with line of centers. Convenient control switch operates spindle drive. All driving vee belts are adjustable and may quickly be replaced without disturbing the lathe or drive assembly or removing the spindle from its bearings.

The No. 918 is furnished with bench or steel cabinet mounting and has a wide selection of attachments.



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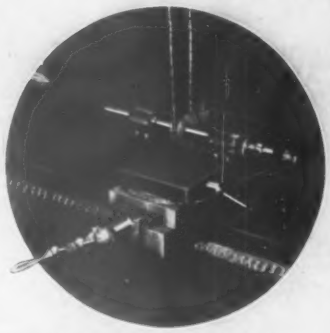

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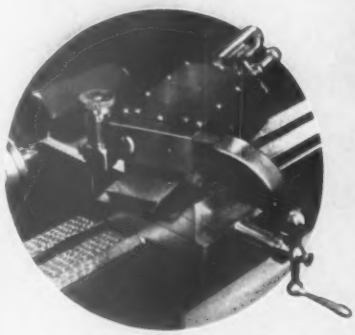

Automatic Slide Rest

SPECIFICATIONS

Swing over bed, dia.	9"
Distance between centers	18"
Collet capacity, max. dia.	1"
Step chuck capacity, max. dia.	6"
Jaw chuck capacity, max. dia.	6"
Spindle capacity, max. dia.	1⅛"
Slide rest, travel of tool post slide	5¼"
Slide rest, travel of cross slide	5¼"
Tailstock spindle travel	3½"
Spindle speeds, eight forward and reverse	
Low range	150-2500 r.p.m.
High range	225-3750 r.p.m.
Weight of lathe, mounting and drive, net	850 lbs.

For Further Description Write for Bulletin 918

RIVETT LATHE & GRINDER INC.

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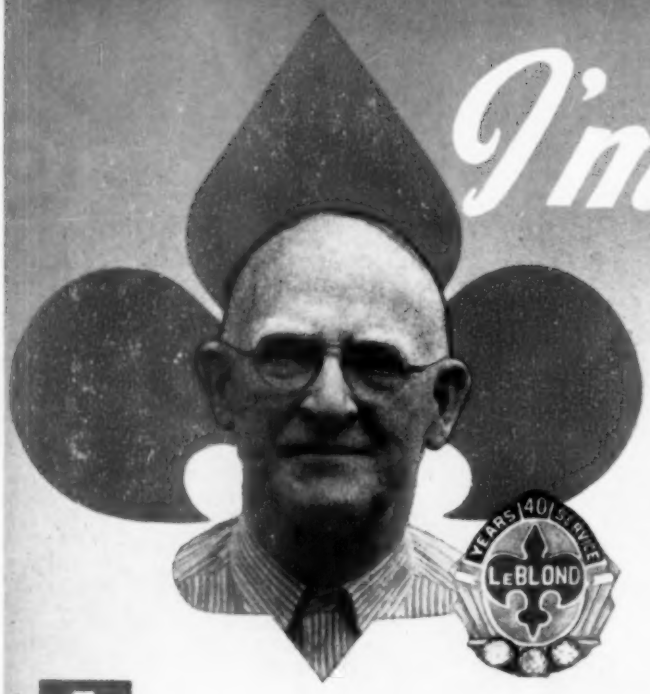
PIONEERS IN BENCH LATHE DEVELOPMENT

I'm Tellin' You

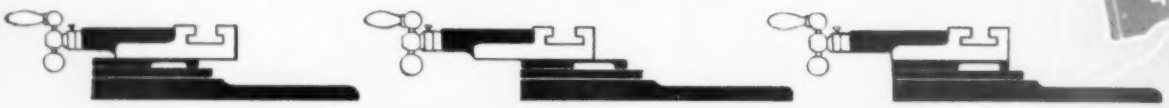


No. 4 in a series of tips on "Keeping 'em Turning"

by George Whitehouse, 41 years at LeBlond

Lots of new lathe hands figure that rough turning is a kind of hacking process that doesn't call for much brain work. It's probably true that roughing isn't as much of a trick as finishing, but there are some important do's and don't's. Here's some dope that you will want to remember.

1 POSITION OF COMPOUND REST FOR ROUGH CUTTING



This is wrong. Slide overhangs too far to right. Might break in middle of tee slot.

This is wrong, too. Slide overhangs to left. Also could break in middle of tee slot.

This is right. When making heavy cuts, top slide should be flush with bottom slide all metal is in compression.

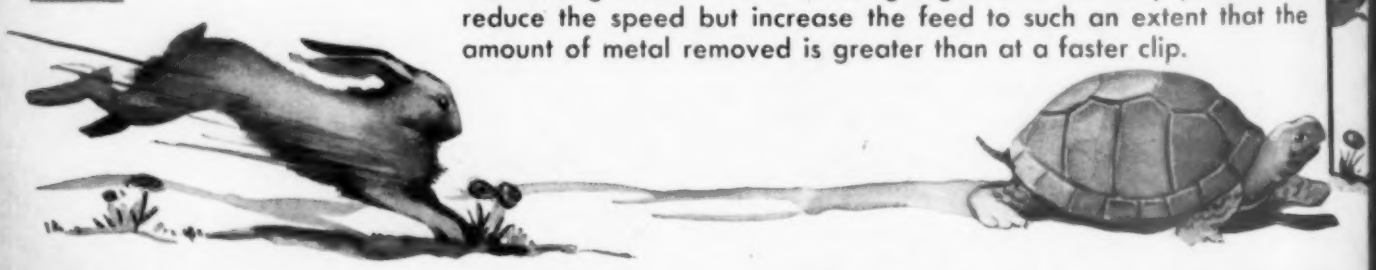
2 CUTTING SPEEDS

KIND OF MATERIAL	CUTTING SPEED Ft. per Min.	DEPTH OF CUT Inch.	RATE OF FEED Per Rev.
CAST IRON	210	3/8	0.062
SEMI-STEEL	280	1/8	0.012
TOOL STEEL	140	1/2	0.020
BRONZE	425	3/16	0.024
BRASS	458	3/32	0.108
ALUMINUM ALLOY	570	1/8	0.031

When using carbide type tools, these figures are as good as any for a general guide. The rigidity of the machine and tool support, interrupted cuts, etc. will make experimentation and adjustments desirable.

3 SLOW DOWN AND FINISH SOONER . . . .

There is a tendency for many lathe operators to work their machine far below top efficiency because they fail to take a deep enough bite. Where tool failure is the limiting factor in size of roughing cut, it is usually possible to reduce the speed but increase the feed to such an extent that the amount of metal removed is greater than at a faster clip.



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